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(71) Applicant: **KIMBERLY-CLARK WORLDWIDE, INC.** [US/US]; 401 North Lake Street, Neenah, WI 54957-0349 (US).

(72) Inventors: **FAULKES, Michael, John**; 2320 Fiesta Court, Neenah, WI 54956 (US). **NEWMAN, William, Robert**; 807 Louise Road, Neenah, WI 54956 (US). **ROMME, Steven, John**; 3409 Brooks Road, Oshkosh, WI 54904

(US). **DELLERMAN, Paige, Annette**; 1354 West Harris Street, Appleton, WI 54914 (US). **RIVERA, Ligia, A.**; 1900 N. McCarthy Road, Appleton, WI 54913 (US). **VE-LAZQUEZ, Herb, F.**; 3142 Westfield Ridge, Neenah, WI 54956 (US). **LARSON, Jennifer, Cappel**; 1545 Maricopa Drive, Oshkosh, WI 54904 (US). **BOCHMANN, Cherry, A.**; 1906 East 120th Street, Cleveland, OH 44106 (US). **KALMAN, Jeffrey, M.**; 1849 Cadwell Avenue, Cleveland Heights, OH 44118 (US). **DEGREEN, Gerald, P.**; 5569 Mayfield Road, Windsor, OH 44099 (US).

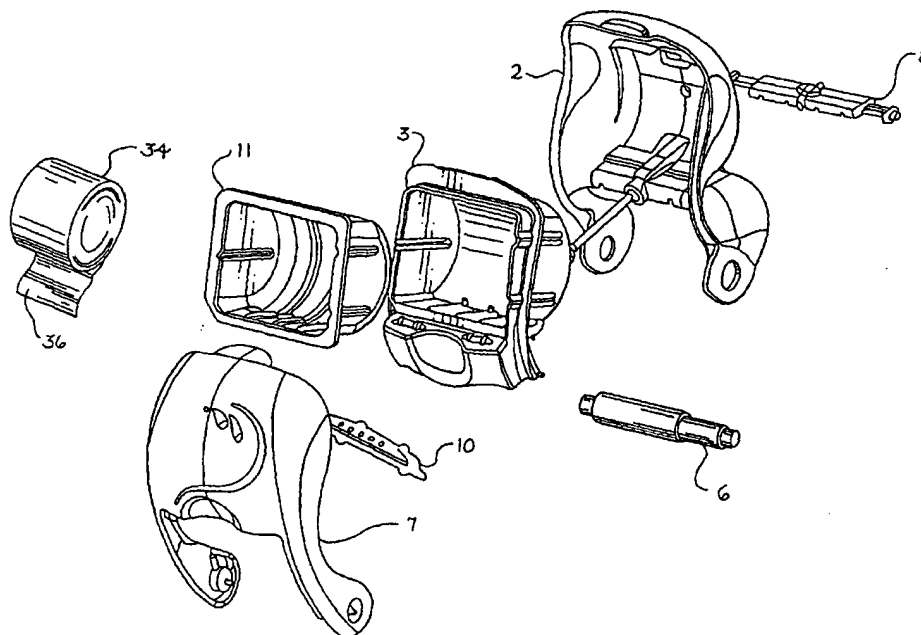
(74) Agent: **BELVIS, Glen, P.**; Brinks Hofer Gilson & Lione, P.O. Box 10087, Chicago, IL 60610 (US).

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(54) Title: WIPES DISPENSING SYSTEM



(57) Abstract: There is provided a system and apparatus for dispensing wet wipes. The system may include a wiper assembly, which may include a chassis, a wiper blade, and a tensioner. The wiper assembly minimizes the amount of wipes which cannot be dispensed. The wiper assembly may be mounted to a dispenser for wipes.

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WIPES DISPENSING SYSTEM

5 This application is a continuation in part of pending U.S. application
entitled Wipes Dispensing System, Serial No. 09/659,295, attorney docket no.
659/703 filed September 12, 2000, which is a continuation in part of pending
U.S. application entitled System and Dispenser for Dispensing Wet Wipes,
Serial No. 09/565,227, attorney docket no. 659/648 filed May 4, 2000, which
is a continuation in part of pending U.S. application entitled Dispenser For
Premoistened Wipes, Serial No. 09/545,995, attorney docket no. 659/623,
10 which was filed on April 10, 2000, the disclosures of which are hereby
incorporated by reference.

BACKGROUND OF THE INVENTION

15 Wet products such as wet wipes have many applications. They may
be used with small children and infants when changing diapers, they may be
used for household cleaning tasks, they may be used for cleaning hands, they
may be used as a bath tissue, they may be used as by a caregiver to clean a
disabled or incontinent adult, or they may be used in and for a whole host of
other applications, where it is advantageous to have a wipe or towel that has
20 some wetness or moisture in it.

Wet wipes have been traditionally dispensed in sheet form from a tub
like container with a hinged lid on the top. The lid is opened and individual or
singularized sheets of the wipes are removed. Another type of container that
has been used for wet wipes provides a roll of wipes in which the wipes are
25 pulled from the top of the container in a direction that is parallel to the axis of
the roll. These wipes are pulled from the center of a hollow coreless roll that
has perforated sheets. These containers generally have a snap top lid that is
opened to expose a piece of the wipes that can then be pulled to remove the
desired amount of wipes. Once pulled out the wipes can then be torn off,
30 usually at a perforation, and the lid closed.

Wet wipes can be any wipe, towel, tissue or sheet like product including natural fibers, synthetic fibers, synthetic material and combinations thereof, that is wet or moist or becomes wet during use or prior to use. Wet wipes may be dispersible when in contact with water or may be non-

5 dispersible. Examples of wet wipes are disclosed in application serial numbers 09/564,449; 09/564,213; 09/565,125; 09/564,837; 09/564,939; 09/564,531; 09/564,268; 09/564,424; 09/564,780; 09/564,212; 09/565,623 all filed May 4, 2000, and application serial no. 09/223,999 entitled Ion-Sensitive

10 Hard Water Dispersible Polymers And Applications Therefore, filed December 31, 1998, the disclosures of which are incorporated herein by reference. Embodiments of dispensers are described in application serial numbers 09/565,227 and 09/545,995; in application serial numbers 09/659,307; 09/659,295; 09/660,049; 09/659,311; 09/660,040; 09/659,283; 09/659,284; 09/659,306, filed September 12, 2000; in application serial

15 number 09/748,618, filed December 22, 2000; in application serial number _____, filed April 24, 2001, having lawyer docket number 14,676.12, entitled System For Dispensing Plurality of Wet Wipes; and in application serial number _____, filed April 27, 2001, having lawyer docket number 659/789; the disclosures of which are incorporated herein by reference.

20 SUMMARY OF THE INVENTION

In an embodiment of the invention there is provided a wiper assembly for a wipes dispenser comprising: a chassis; and a wiper blade.

These embodiments may further comprise an assembly wherein the wiper blade and chassis are integral; the wiper blade and chassis are

25 connected by an adhesive; the wiper blade is removably attached to the chassis; the wiper blade comprises at least one button, and the chassis comprises at least one opening, the button and opening coordinating to attach the wiper blade to the chassis; and the diameter of the button is greater than the diameter of the opening.

30 In an embodiment of the invention there is provided an assembly comprising a wiper assembly and a wipes dispenser; the wiper assembly

comprising a chassis and a wiper blade; the dispenser comprising wiper and a gap; the wiper comprising a tail; the wiper capable of being removed from the dispenser by pulling the tail through the gap.

5 These embodiments may further comprise an assembly wherein the chassis comprises at least one collar; and the dispenser comprises at least one post; the collar and post coordinating to mount the chassis to the dispenser.

10 These embodiments may yet further comprise an assembly wherein the wiper blade comprises fingers; and the dispenser comprises guides; the fingers and guides coordinating to secure the tail of the wiper. The fingers may comprise raised areas; the assembly may further comprise a tensioner; the wiper may be configured in a roll comprising sheets, which may be capable of being unwound as the wiper is removed, such that less than 6 sheets are retained in the dispenser, less than 4 sheets are retained in the dispenser, less than 3 sheets are retained in the dispenser, or less than 2 sheets are retained in the dispenser; the sheets retained in the dispenser may be configured in a roll having a diameter less than 15 mm, less than 10 mm; or less than 8 mm. The tensioner may be a plurality of fins, a plurality of rounded ridges, a rounded member, or a wedge.

20 In an embodiment of the invention there is provided a wiper assembly for a wiper dispenser comprising: a wiper blade; and a tensioner.

25 These embodiments may further comprise an assembly wherein the tensioner is a plurality of fins, a plurality of rounded ridges, a rounded member, or a wedge; and the assembly further comprises a chassis, wherein the chassis can be mounted to a dispenser.

30 In an embodiment of the invention there is provided an assembly comprising a wiper assembly and a wiper dispenser; the wiper assembly comprising a wiper blade and a tensioner; the dispenser comprising a roll of wiper and a gap; the wiper comprising a tail; the wiper capable of being removed from the dispenser by pulling the tail through the gap.

 These embodiments may further comprise an assembly wherein the wiper blade comprises fingers; and the dispenser comprises guides; the

fingers and guides coordinating to secure the tail of the wipes. These
embodiments may yet further comprise an assembly wherein: the fingers
comprise raised areas; the roll is capable of being unwound as the wipes are
removed, such that less than 6 sheets are retained in the dispenser, less than
5 4 sheets are retained in the dispenser, less than 3 sheets are retained in the
dispenser, or less than 2 sheets are retained in the dispenser; the sheets
retained in the dispenser are configured in a roll having a diameter less than
15 mm, less than 10 mm, or less than 8 mm; and the roll is maintained away
from the gap by contact with the tensioner when the tail is pulled through the
10 gap.

In an embodiment of the invention there is provided a dispenser for
wipes comprising: a roll of wipes; the roll comprising a tail; a wiper assembly;
the wiper assembly comprising a chassis, a wiper blade, and a tensioner; a
cover; the cover comprising at least one post; and a gap.

15 These embodiments may further comprise a dispenser wherein the
chassis comprises at least one collar; the collar and the post coordinating to
mount the chassis to the cover. These embodiments may yet further
comprise a dispenser wherein the tensioner is a plurality of fins, a plurality of
rounded ridges, a rounded member, or a wedge. These embodiments may
20 yet further comprise a dispenser wherein: the wipes can be removed from the
dispenser by pulling the tail through the gap; the roll is capable of being
unwound as the wipes are removed, such that less than 6 sheets are retained
in the dispenser, less than 4 sheets are retained in the dispenser, less than 3
sheets are retained in the dispenser, or less than 2 sheets are retained in the
25 dispenser; the sheets retained in the dispenser are configured in a roll having
a diameter less than 15 mm, less than 10 mm, or less than 8 mm; the chassis
and tensioner are integral; the wiper blade is removably attached to the
chassis; and the wiper blade comprises at least one button, and the chassis
comprises at least one opening, the button having a diameter greater than the
30 diameter of the opening, and the button and opening coordinating to attach
the wiper blade to the chassis.

In an embodiment of the invention there is provided a method for dispensing wipes comprising: providing wipes in a dispenser; the wipes comprising a tail; the dispenser comprising a wiper assembly and a gap; and the wiper assembly comprising a tensioner; pulling the tail from the dispenser through the gap; and maintaining the wipes away from the gap by contact with the tensioner.

These embodiments may further comprise a method wherein: the wipes are configured in a roll, the roll comprising a cigarette; the roll comprises sheets, the sheets defined by lines of perforation separated by a distance of about 114 mm to about 127 mm, or of about 120 mm; the pulling the tail from the dispenser comprises unwinding the roll of wipes; the cigarette is retained in the dispenser, wherein the cigarette comprises less than 6 sheets, less than 4 sheets, less than 3 sheets, or less than 2 sheets, or wherein the cigarette has a diameter less than 15 mm, less than 10 mm, or less than 8 mm.

In an embodiment of the invention there is provided a dispenser for wipes comprising: means for containing wipes; the wipes comprising a tail; and the means comprising a gap; means for securing the tail of the wipes in the gap; means for preventing the wipes from wedging in the gap.

These embodiments may further comprise a dispenser wherein: the wipes can be removed from the dispenser by pulling the tail through the gap; the wipes are configured in a roll, the roll comprising a cigarette, the roll capable of being unwound as the wipes are removed, and the cigarette retained in the dispenser; and the cigarette has a diameter less than 15 mm, less than 10 mm, or less than 8 mm.

In an embodiment of the invention there is provided a dispenser for wipes comprising: a wiper assembly; the wiper assembly comprising a chassis, a tensioner, and at least one wiper mounting element; and a cover; the cover comprising at least one cover mounting element; the wiper mounting element and the cover mounting element coordinating to mount the wiper assembly to the cover.

5 These embodiments may further comprise a dispenser wherein: the wiper mounting element is a collar, and the cover mounting element is a post; the wiper mounting element is a post, and the cover mounting element is a collar; and the number of wiper mounting elements is equal to the number of cover mounting elements.

10 In an embodiment of the invention there is provided a wiper assembly for a wet wipes dispenser comprising: a first means for mounting the assembly to the dispenser; the first means comprising a first material; a second means for contacting the wipes; the second means comprising a second material; the second material of the second means being more flexible than the first material of the first means; a means for reducing the evaporation of moisture from the wet wipes in the dispenser; and, a means for providing tension to the wet wipes so that the wipes can be withdrawn from the dispenser in a continuous manner without binding or tearing.

15 In an embodiment of the invention there is provided a wiper assembly for a wet wipes dispenser comprising: a first section; the first section having a length and a width, the length being greater than the width; the first section having a front surface and a back surface, the back surface for positioning adjacent the dispenser; the first section having a first opening and a second opening; and a second section; the second section in contact with the top surface of the first section, the second section having an extension, the extension positioned in the second opening of the first section.

20 In an embodiment of the invention there is provided a wiper assembly for a wet wipes dispenser comprising: a chassis; the chassis comprising a top edge, a bottom edge, two side edges, a length, a width, a top surface and a back surface; the chassis comprising a first and a second collar; the collars being spaced apart and adjacent to the top edge; the chassis comprising a plurality of openings; and, a blade; the blade comprising a top surface and a back surface; a portion of the back surface in contact with the top surface of the chassis; the back surface comprising a plurality of buttons; a portion of the blade extending below the chassis bottom edge; the buttons positioned in the

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openings; and the blade comprising extending members, the extending members not being in contact with the surface of the chassis.

DRAWINGS

Figure 1 is a perspective view of a dispenser.

5 Figure 2 is an exploded view of a dispenser and cartridge.

Figure 2a is a plan view of a portion of the front of the tray.

Figure 3 is a perspective view of an open dispenser.

Figure 4 is a top view of a dispenser.

Figure 5 is a front view of a dispenser.

10 Figure 6 is a bottom view of a dispenser.

Figure 7 is a side view of a dispenser.

Figure 8 is a back view of a dispenser.

Figure 9 is a cross section view of a dispenser and cartridge taken along line A-A of Figure 5.

15 Figure 10 is a cross section view along line D-D of Figure 9.

Figure 11 is a cross section view along line E-E of Figure 9.

Figure 12 is a cross section view along line F-F of Figure 9.

Figure 13 is a cross section view of a dispenser and cartridge taken along line C-C of Figure 5.

20 Figure 14 is a cross section view along line J-J of Figure 13.

Figure 15 is a cross section view along line K-K of Figure 13.

Figure 16 is a perspective view of a dispenser with a wet wipe.

Figure 17 is a perspective view of a dispenser, a cartridge and a roll of wet wipes.

25 Figure 18 is a perspective view of a roll of wet wipes

Figure 19 is a cross section view of a dispenser, a cartridge and a roll of wet wipes.

Figure 20 is a cross section view of a cartridge and a roll of premoistened wipes.

30 Figure 21 is a cross section view of a cartridge.

Figure 22 is a perspective view of the outside of a cover.

Figure 23 is a front view of the outside of a cover.

Figure 24 is a perspective view of the inside of a cover.

Figure 25 is a cross section view of a cover.

Figures 26-28 are views of a tray.

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Figures 29-31 are views of a roller.

Figures 32-37 are views of a wiper assembly.

Figure 36 is a view along line A-A of Figure 35.

Figure 34 is a view along line A-A of Figure 32.

Figures 38-39 are views of a wiper.

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Figures 40-41 are views of a roller.

Figures 42-45 are views of a mounting assembly.

Figures 46-50 are views of a screw used in conjunction with the mounting assembly.

Figures 51-53 are views of a cartridge.

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Figure 54 is a top view of a package of cartridges.

Figure 55 is a perspective view of a dispenser.

Figure 56 is an exploded view of a dispenser and cartridge.

Figure 57 is a front plan view of a wiper assembly.

Figure 58 is a front plan view of a wiper assembly.

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Figure 59 is a plan view of a wiper blade.

Figure 60 is a cross-sectional view of a wiper blade.

Figure 61 is a perspective view of a wiper blade.

Figure 62 is a cross-sectional view of a dispenser.

Figure 63 is a cross-sectional view of a portion of a dispenser.

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Figure 64 is a perspective view of the inside of a cover.

Figure 65 is a top view of the inside of a cover.

Figure 66 is a view of a conventional bath tissue holder.

Figure 67 is a view of a conventional bath holder.

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Figure 68 is a view of a mounting assembly in a conventional bath tissue holder (shown without the dispenser).

Figure 69 is a perspective front view of a wiper assembly.

Figure 70 is a perspective back view of a wiper assembly.

Figure 71 is a view of a wiper chassis.

Figure 72 is a view of a wiper blade.

Figure 73 is a front plan view of a wiper assembly.

Figure 74 is a side cross sectional view of a wiper assembly.

5 Figure 75 is a rear plan view of a wiper assembly.

Figure 76 is a top plan view of a wiper assembly.

Figure 77 is a bottom plan view of a wiper assembly.

Figure 78 is a front plan view of a wiper chassis.

Figures 79-80 are side cross sectional views of a wiper chassis.

10 Figure 81 is a rear plan view of a wiper chassis.

Figure 82 is a top cross sectional view of a wiper chassis.

Figure 83 is a top plan view of a wiper chassis.

Figure 84 is a bottom plan view of a wiper chassis.

Figure 85 is a side plan view of a wiper chassis.

15 Figure 86 is a front plan view of a wiper blade.

Figure 87 is a front view of a wiper blade finger.

Figure 88 is a side cross sectional view of a wiper blade finger.

Figure 89 is a rear plan view of a wiper blade.

Figure 90 is a side cross sectional view of a wiper blade.

20 Figures 91 A-C are partial side views of a dispenser with a tensioner

DETAILED DESCRIPTION OF PRESENTLY PREFERRED EMBODIMENTS OF THE INVENTION

25 A system and method for dispensing and providing wipes is provided, which in general may have a housing, a cover, and a cartridge having a roll of wet wipes. The cartridge is placed in the housing and then the wipes can be removed from the dispenser.

30 In general there is provided a device for mounting a wet wipes dispenser to another surface. That surface may be, by way of example, a wall in a bathroom, a kitchen wall, or a bathroom vanity wall. The device may be used with, or adapted for use with, most any type of wet wipes dispenser, such as the various dispensers illustrated and disclosed herein. The device is ideally adapted to work in conjunction with a conventional bath tissue holder

to permit a dispenser to be securely, yet removably attached to the wall. A conventional bath tissue holder is the type that is typically found in a home. Such holders have posts that protrude from the wall and a rod or roller that is positioned between the posts. These holders may also be partially recessed into the wall. Such a holder and a holder with a mounting assembly engaged are illustrated in Figures 66-68. The device may also be used in the absence of a conventional bath tissue holder and may be adapted to provide that the dispenser is fixed to the wall.

For example, the system may have a dispenser that has a housing, which is capable of being mounted to a surface, such as a wall, a cabinet, an existing bath tissue dispenser, a toilet, a toilet tank, a stall wall, or a dashboard of an automobile. The dispenser has an opening that holds a cartridge, which contains the wet wipes. These cartridges are sealed and may be grouped in packages of multiple cartridges. Thus, a package of cartridges may be provided to a user. The user may then select and open one of the cartridges, put it in the dispenser, and use the wipes as needed. When the wipes are used up, the user may simply discard the old cartridge and replace it with a new one. Thus, this system enables the user to conveniently obtain and keep several cartridges of wipes on hand and then use the wipes as needed. By using sealed cartridges to refill the dispenser the user is using a new and fresh product each time and a product that is in contact with fresh surfaces.

By way of example, referring to Figures 1 through 15, there is provided a dispenser 1, which has a housing 2, a tray 3, a cover 7, and a mounting assembly 8. The tray and the cover form a gap 4, through which a wet wipe can extend. That portion of the wipe extending through the gap may be referred to as a tail. The tray and cover additionally have recesses 5, that form an indentation that provides a finger hold, or point where a user can grasp the wet wipe to pull it from the dispenser. Although optional, this dispenser is also provided with a roller 6 for mounting and dispensing a roll of another product, such as dry or conventional bath tissue.

In general the dispenser system illustrated herein can be used with or without conventional dry toilet or bath tissue. If conventional tissue is used with wet wipes it could be positioned in a side-by-side manner, above, or below the wet wipes.

5 Figures 1 and 4-8 show the dispenser with the cover closed. In Figures 4 and 6, it can be seen most easily that the dispenser generally has a top 100, a side 101, a side 102, a back 103, a bottom 104 and a front 105. Figure 2 shows the dispenser and a cartridge in a exploded view. Figure 3 shows the dispenser assembled and in a fully opened condition. The fully
10 opened condition provides access to screw 9.

 The housing may be made from any suitable material, such as plastic, wood, ceramic, porcelain, glass, paper, metal, thermoplastic elastomers, or composite materials. For example, polypropylene, polyesters such as polybutylene terephthalate (Pbt), Pbt glass filled, Pbt 15% glass filled,
15 fiberglass, carbon fiber, and acrylonitrile-butadiene-styrene (ABS) may be used to make the housing.

 The housing may have different shapes and sizes. When the dispenser is intended for use in a home it is desirable that it be of a size that is similar to conventional bath tissue roller mounts. It is particularly desirable
20 that the dispenser be as compact as possible for home use. Further if the cover is in the range of from about 4-1/2 inches (114.3 mm) to 6-7/8 inches (174.6 mm) in width it will be able to aesthetically fit in or mount to the vast majority of toilet paper holders that are in existing houses. Preferably the width of the cover may be greater than about 3 inches (76.2 mm), less than
25 about 6 inches (152.4 mm), less than about 7 inches (177.8 mm), and less than about 8 inches (203.2 mm). The 4-1/2 inches (114.3 mm) by 6-7/8 inches (174.6 mm) size provides an added benefit of enabling one size of dispenser to be used in the vast majority of applications in the home. Smaller sizes may be desirable for certain applications or aesthetic reasons, such as a
30 small bathroom. The dispenser and its components may have varied colors, such as the almonds and whites that are seen in porcelain bath fixtures or may have any other desirable color. When the housing is used for industrial

or institutional purposes or in commercial applications it may be desirable to make the housing substantially larger and able to hold substantially more rolls of either or both wet and dry wipes and tissue.

5 The housing may be configured as shown in Figure 1 to mount onto or into a conventional wall mount toilet paper holder. It may also be mounted directly to a wall, for example by way of a screw, through mounting hole 30, or by other means of fixing the housing to a wall or surface, such as glue, nails, screws, rivets, magnetic attachments, staples, engaging brackets and pressure mountings against the sides of a conventional wall mount for toilet
10 tissues. The housing also may have a lock 13 that engages a tab 12 on the cover to keep the cover closed, yet provide an easy way to open the dispenser. Various other ways to lock or fix the cover to the housing may also be employed. For example, a lock and key approach may be desirable in commercial applications or houses where there are small children present.

15 The housing may also have an opening 14 that is made to receive cover mounts 29. The opening 14 and the cover mounts 29 may further be configured to receive a conventional toilet tissue roller. The housing may further be configured to support a means of dispensing, storing, containing or mounting another product such as wipes, toilet tissue, or the like. For
20 example, the housing may support a shelf which may in turn support a container of wet wipes having the same or a different composition from that of the wipes inside the housing. The housing may further have an opening 28 for receiving a pin 27 on the tray 3.

 The cover 7 may be made of any similar material to the housing; it may
25 be the same as or a different material from the housing. The cover may be clear or have a window for viewing the amount of wet wipes that remain in the dispenser. It is noted, however, that because the cover is in direct contact with the wet wipe, the cover forms the top of the cartridge when the cartridge is inserted into the dispenser and the cover closed, and wood or any other
30 material that would support bacterial growth would not be favored. It is preferred that all materials that are in contact with the wet wipes be made from materials that discourage, or do not support bacterial growth.

Moreover, anti-bacterial agents, medicinal, botanical or skin and health agents may be added to the materials that are used to construct the components of the dispenser system, including by way of example the dispenser housing, the tray, the wiper blade, the wiper assembly, the cartridge, the cover and the gaskets. In particular any component that is in contact or associated with the wet wipes may have such an agent added to it.

The cover is designed to cooperate with the cartridge 11 to form a barrier to moisture loss from the wet wipes. The cover may also be designed to cooperate with other components of the dispenser system to form a moisture barrier. The dispenser can maintain wet wipes in a moist condition when fully closed for at least 1 day, for at least 2 days, for at least 5 days and for at least 14 days, and preferably for more than 14 days at room conditions of 73 °F (22.8°C) and 50% relative humidity. The dispenser when fully closed can maintain at least about 15%, at least about 20%, at least about 25%, at least about 50%, and at least about 95% of the moisture of the wipes for a 14 day period at 73 °F (22.8°C) and 50% relative humidity. These moisture retention values can be obtained with a tail of the wipe protruding through the gap, the tail having a length of not more than 1.5 inches (38.1 mm).

The cover may further be designed to cooperate with the cartridge 11, or other components of the dispenser system, to form a barrier to contamination of the wipes within the dispenser. Thus, the cover in cooperation with the cartridge, or other components of the dispenser system, may form a barrier to dirt, dust, mold spores and bacteria.

The space between the inner surface of the front cover and the surface of the lip of the cartridge may vary between about 2 mm and about 10 mm. In this way there is formed a dome above an open cartridge that at least partially covers that opening, which dome is preferably less than about 15 mm, less than about 10 mm, less than about 5 mm and ideally is less than about 2 mm above the lip of the cartridge. The height of the dome may also be measured from the surface of a full roll of wet wipes in which an additional 2 to 7 mm may be added to the height of the dome. Higher domes may also be employed, but such higher domes may be less aesthetically pleasing and may

provide for greater amounts of evaporation or moisture loss from the wet wipes.

The cover may be provided with an inside rim 33 (see, e.g., Figure 3) and a wiper 10 (see, e.g., Figures 2 and 3). The cover inside rim and wiper cooperate with the lip 31 of the cartridge. In this way when the cover is closed the inside rim is brought against the lip of the cartridge and the wiper is similarly brought against the tray including the guides, as well as the lip of the cartridge. In a further embodiment, the cover may be provided with a lip, and the cartridge may be provided with a rim to facilitate the cooperation.

The distance between the inside of the cover where the wiper is located and the tray may be less than the height of the wiper blade. Thus, in this configuration the wiper blade would be placed under compression against the lip, the tray, or the guides 16, or all of them depending on the position of the wiper. Here the wiper blade would exert pressure on the wet wipes. The wiper may also be positioned so that it contacts the wet wipe but does not exert pressure against it, or be positioned so that it is a short distance above the wet wipe. The amount of pressure that the wiper exerts on the wet wipe may vary depending upon several factors, including the purpose for the wiper, the material that the wiper blade is made from, the material that the wet wipe is made from and the material that the cartridge lip 31 is made from.

The tray 3 may be made from any similar material to the housing or cover, and it may be the same material or different material from those of components. The tray may have side walls 22, 23, 80 and 81. Walls 22 and 23 correspond to the sides of the dispenser, wall 80 corresponds to the top of the dispenser, and wall 81 corresponds to the bottom of the dispenser. The tray shown in the figures does not have a back wall, although one may be provided if desired. The side walls may be provided with recesses 24, 25, and 26. These recesses cooperate with protrusions 19, 20 and 21 on the cartridge (19 with 26, 20 with 24 and 21 with 25). In this way the cartridge is securely, yet easily removably held in the dispenser. The tray opening 15 is sized in relation to the cartridge (or the cartridge may be sized in relation to

the tray opening) so that the cartridge can easily be slid into and out of the dispenser.

5 The tray and cartridge together result in a keyed type arrangement that allows the cartridge to be inserted fully or properly in only one orientation into the dispenser. Thus the two elements fit together in a manner similar to a lock and key. This assures that the roll of wipes will unwind from a predetermined orientation, i.e., from the bottom of the roll or the top of the roll. As is apparent from Figure 2 the tray opening and cartridge are not symmetrically shaped. This asymmetry provides for the keyed arrangement.

10 An object is considered symmetrical if there can be a plane which passes through the object such that the portions on either side of the plane are reflections of each other.

In the embodiment shown in Figure 2 the asymmetry in the vertical plane is obtained by having a different number and location of protrusions and recesses on opposite sides. It is recognized that any suitable means to accomplish asymmetry may be employed, such as notches, tongue and groove, or the shapes of the opening and detents. For example, some of the cartridge walls may be flat while others are rounded, or the cartridge lip may be non-planar. Additionally, labeling or marking of the cartridge, the tray, or both can create the effect of asymmetry.

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The housing may further have guides 16. The guides may be movable or fixed. The guides may have raised surfaces 16a and lowered surfaces 16b. These guides may be made from the same type of material as the housing. They may be integral with the housing. The guides and the housing may be one continuous piece of plastic. The guides may be designed to cooperate with the wiper to prevent or reduce the tendency of the wipe to skate to one side of the dispenser as the wipe is pulled out and torn off. The guides may also cooperate with the wiper to regulate and control the amount of drag. The tray may have barbs 71 to discourage the placement of wet wipes directly into the dispenser without the use of a protective package, a practice which could cause premature drying of the wet wipes or could allow

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the growth of bacteria and/or mildew in the wipes. An example of tray without barbs is seen at Figure 26.

5 The cartridge may be made out of any suitable material, such as plastic. It is preferable that the cartridge be made from a light weight, inexpensive, disposable and recyclable material. The cartridge has side walls 17, 18, 39 and 40 and bottom wall 41. The cartridge has a lip 31 that forms an opening at the top of the cartridge. The cartridge has ribs 32. The ribs may extend part way or all the way along the sides 39 and 40 and the bottom 41. The ribs 32 may cause grooves or indentations to form in the rolls, depending on the density of the roll and conditions of use. These grooves are not necessary to the use of the dispenser system. The curvature of the cartridge bottom is between 40 and 45 degrees, preferably between 42 and 44 degrees.

15 The cartridge may be any shape or size provided that it fits in or cooperates with the dispenser. For example a cartridge that would be useful for application in the home would have side walls 17 and 18 that are less than 105 mm and side walls 39 and 40 that are less than 134 mm.

20 Instead of protrusions 19, 20 and 21, the cartridge may have recesses at those locations, and the tray may have corresponding protrusions. Moreover, the cartridge may have ribs, like rib 32, along side walls 17 and 18.

25 The cartridge may have a lid or cover with a removable strip. Removal of this strip would result in a gap through which the wipes can be dispensed. In this configuration, it may be useful to attach the tail of the wipes to the strip. In this way, removal of the strip facilitates the threading of the wipes through the gap. The cartridge may also have a removable seal over the cover.

30 The container for the wet wipes may also be flexible. A flexible package made of plastic, metal foil, paperboard or combinations thereof may be used to seal the wipes in a wrapper or may be configured as a pouch with a removable cover. Any material and configuration that prevents the loss of moisture from the wet wipes may be used to package the wipes. A removable cover may contain a removable strip to facilitate dispensing of the wipes. The cover may also contain a lip to cooperate with the cover inside rim and the

wiper. The combination of the wipes and the container may be the same size as or smaller than the cartridge so as to fit within the tray.

Figure 16 shows a dispenser in the closed condition with a tail of a wet wipe 36 protruding from gap 4 into the finger hold indentation that is formed by recess 5. In use the tail of the wet wipe would be grasped and pulled generally in the direction of arrow 35 causing the roll to unwind and the wipe to be dispensed from the dispenser. In use the wet wipe may also be subjected to forces tangential and perpendicular to the direction of arrow 35. If these forces occur the guides and the wiper help to prevent the wipe from skating to one side of the gap and bunching up or binding.

Figure 17 is an exploded view of a dispenser, cartridge and roll of wipes 34 showing the relationship of these components.

Figure 18 shows a roll of wipes 34 that has a tail 36 and further defines the axis of the roll as 37. Rolls useful with this dispenser or as part of a dispensing system may contain from as little as a few linear inches (or cm) to more than 450 linear inches (11.43 m), to more than linear 600 inches (15.24 m) to more than a thousand linear inches (25.40 m) of wet wipes. The rolls may have a web of material that may have any number of sheets. Usually, the sheets are separated by perforations that enable the sheet to be easily torn from the web but are strong enough that they will not separate while the web is being pulled from the dispenser. An example of a roll that is particularly useful for applications in the home is one that has a diameter of about 2 inches (50.8 mm) to about 3 inches (76.2 mm), of about less than 5 1/2 inches (139.7 mm), and preferably has a diameter of about 3 inches (76.2 mm) and more preferably of about 2-7/8 inches (73.0 mm). This roll has from about 400 linear inches (10.16 m) of wipes to about 1000 linear inches (25.40 m) of wipes. Without limitation, each sheet length may be from about 3 inches (76.2 mm) to about 10 inches (254.0 mm) and preferably are about 4.5 inches (114.3 mm). This roll may further have a density of from about 0.3 g/cc to about 1 g/cc, from about 0.5 g/cc to about 1 g/cc and preferably about 0.62 g/cc. A particular example of a roll may be one having a diameter of about 2 inches (50.8 mm) and containing about 450 linear inches (11.43 m) of

wipe. Another particular example of a roll may be one having a diameter of about 3 inches (76.2 mm) and containing 450 linear inches (11.43 m) of wipes.

5 The preferred form of wet wipes for use with the dispenser system is a solid coreless roll as shown in Figure 18. It is to be understood, however, that cored rolls (hollow cores, solid cores and partially solid cores), hollow coreless rolls, and stacks of sheets may also be used in the dispenser system. When density values are referred to herein, it is for the density of the roll and this would exclude any void, for a coreless hollow roll, or space occupied by a
10 core for a cored roll.

Various tests and observations of physical properties are reported in Tables I, II, III, and IV.

Solution add-on level is the amount of solution by weight divided by the amount of dry wipe by weight multiplied by 100 to provide a percentage value.

15 Base sheet converting refers to the width of the roll and the sheets in the roll, i.e., along axis 37 of the roll in inches.

Perforation refers to the amount of cutting and the distance between the cuts in the perforation that separates the sheets in a roll. There are three parameters to this measurement: cut length, bond length and bond spacing.
20 The bond spacing is equal to the sum of the cut length plus the bond length. By way of example, perforations that are useful with wet wipes are ones that have a bond length of 0.02 inch (0.51 mm), a cut length of 0.05 inch (1.27 mm), and a bond spacing of 0.07 inch (1.78 mm), or one that has a bond length of 0.04 inch (1.02 mm), a cut length of 0.09 inch (2.29 mm) and a bond
25 spacing of 0.13 inch (3.30 mm).

Dry basis weight is the basis weight of the wipe before the solution is added to the wipe, i.e., before it is wet.

Wet thickness is the thickness of a wet wipe, i.e., after the solution has been added to it, in mm.

30 Sheet count is the number of sheets in a roll, i.e., the number of sheets created by the perforations.

Although all tests are done under TAPPI standard test conditions, the wet wipes are not equilibrated to those conditions. Instead, the wipes are removed from a sealed container or cartridge and tested within a few, generally less than 5-10, minutes after opening. This is about a 5 minute variation in this time period that the wet wipe is exposed to the atmosphere, which does not materially or significantly alter the test results.

Tensile, stretch and TEA (total energy absorbed) values were obtained on the wet product following ASTM 1117-80, section 7, with the following modifications: sample dimensions were 1+/- 0.04 inch (25.4 +/- 1.0 mm) wide and 4.25 +/- 0.04 inches (108.0 +/- 1.0 mm) wide; initial gauge length was 3 +/- 0.04 inches (76.2 +/- 1.0 mm); test speed is 12 inches/minute (305.0 mm/min).

MD tensile is the peak load before failure per inch width of the sample, as determined in the machine direction. CD tensile is the peak load before failure per inch width of the sample, as determined in the cross direction. MD stretch is the percentage of elongation the wipe has in the machine direction at the peak load. CD stretch is the percentage of elongation of the wipe in the cross machine direction at the peak load. Total Energy Absorbed (TEA) is the area under the force-elongation curve (in units of lb. and ft., respectively) from the start to the failure point divided by the initial surface area of the sample between the upper and lower grips. For these samples, this surface area was 3 sq. inches (19.4 cm²). Ten specimens were tested for each code, and the average was calculated and reported. The test can be carried out on a standard tensile tester such as a MTS Sintech 1/G test machine with TestWorks 3.10 software. Both the Sintech test machine and the TestWorks software are available from MTS Corporation located at 1400 Technology Drive, Eden Prairie, MN.

Detach refers to the force in grams per sheet that is required to break a perforation, i.e., the amount of force required to separate two sheets in a roll along the perforation. These properties were determined using a MTS Sintech 1/G test machine with TestWorks 3.10 software. Two sheets were removed from a roll. The sheets had a width of 4.25 inches (108.0 mm), and

were connected by perforations along the width. The sheets were folded in half along the length such that the width of the sample was 2-1/8 inches (54.0 mm). The top and bottom of the sample were placed in grips having an internal spacing of 2 inches (50.8 mm), such that the perforation line was centered between the upper and lower grips. The upper grip was then displaced upward (i.e. away from the lower grip) at a rate of 10 inches/minute (254.0 mm/min) until the sample was broken along the perforations. The applied force and sample elongation were measured throughout the test. The peak load from the force-elongation curve is recorded so that the detach strength is expressed in units of grams/sheet. The average results from ten samples are reported.

Percentage strain at peak load ("% strain @ pk load") was determined from the results of the test described above. The elongation at the peak load is divided by the initial sample length of 2 inches (50.8 mm), and the result is designated the % strain @ peak load. The average results from ten samples are reported.

Wet thickness refers to the thickness of a wipe that is measured while the sample is subjected to a specified load or weight. The wet thickness of wet wipes and wipes before wetting are reported in Table II. These values are based on samples measuring 3x4 inches (76x102mm) that were individually placed under a confining load of 0.05 pounds/square inch (psi) (345 Pa). The region of the sample that was tested was free of wrinkles and folds. A Starrett Comparator Base Model 653G was used to perform these tests available from Starrett, 121 Crescent St., Athol, MA 01331. This base is precision ground to be flat (tolerance of +/- 0.001 inch, +/- 0.025 mm). A digital displacement indicator (Sony model U30-1SET) was attached to the base via a cantilevered horizontal control arm supported by a vertical shaft. The indicator measures vertical displacement relative to the comparator base to within 0.001 inch (0.025 mm). The load was applied by an acrylic contact foot attached to a vertically traveling spindle shaft that descended to the comparator base. The foot has a diameter of 3.00 inches (76.2 mm), a height of 0.63 inch (16.0 mm) and is flat on the lower surface to a tolerance of +/-

0.001 inch (0.025 mm). The weight of the contact foot, spindle, and the associated hardware, not including the contact force springs in the indicator, is 160.5 +/- 0.1g. The spindle shaft descends to the comparator base with a travel time of 0.5 seconds to 0.75 seconds. The thickness was measured by the indicator as the height of the wipe relative to the surface of the comparator base immediately after the load pressure of 0.05 psi (345 Pa) was applied for 3 seconds. Calibration before testing was performed on a set of standard samples traceable to the National Bureau of Standards.

By way of example and without limitation, wet wipes useful in the present dispensing system may have a dry basis weight from about 10 to about 200 gsm, a dry thickness from about 0.5 to about 2 mm, a wet (i.e., wipe with solution or wetting material added) thickness from about 0.3 to about 0.7 mm, a MD wet tensile at least about 250 g/inch (9.8 g/mm), a CD wet tensile at least about 200 g/inch (7.9 g/mm), a MD wet stretch from about 5% to about 30%, a CD wet stretch from about 5% to about 36%, a TEA MD wet strength of from about 0.5 to 2 ft-lb/sq. inch (0.10 to 0.4 J/cm²), a TEA CD wet strength of from about 0.5 to 2 ft-lb/sq. inch (0.10 to 0.4 J/cm²), and a solution add-on of about 150-350%.

Peel force measures the amount of force in grams/4.25 inches (g/108.0 mm) required to unroll a roll of wet wipes, i.e., the grams required to unroll a roll that is 4.25 inches (108.0 mm) wide. Thus, these values could be normalized to apply to any width roll in grams/inch of roll width basis. The peel force, as reported in Table II was the force required to unroll a roll as it was resting in an open cartridge and was measured with an MTS Sintech 1/G test machine with TestWorks 3.10 software. A 4.5-inch (114.3 mm) wide clamp with rubber surfaces gripped the tail of a roll, with the roll positioned directly underneath the clamp such that the tail would remain vertical as it was unwound from the roll. The clamp was attached to the crosshead, which pulled the tissue web upward at a speed of 100 cm/minute. Peel force was measured by a 50 Newton load cell. The average load to pull 18 to 20 sheets away from the roll was recorded by averaging two runs in which 4 sheets each were separated and two runs in which 5 sheets each were separated.

Only the first 18 to 20 sheets from the roll were used to obtain the measurements of Table II.

5 The dispensing force, which is the force to pull the wet wipes from the dispenser, may also be determined. This force can be measured with a MTS Sintech 1/G test machine equipped with TestWorks 3.10 software. A clamp with rubber surfaces grips the tail of a roll of wet wipes placed in a dispenser. The initial distance between the clamp and the platform where the dispenser sits is about 12 inches (304.8 mm). The dispenser is placed underneath the clamp. The clamp is attached to the crosshead, which pulls the roll upward at 10 a speed of 100 cm/min. The pull force is measured by a 50 Newton load cell. For each run, the pull force as a function of pull distance curve for pulling 4 sheets away from a roll is recorded using the TestWorks 3.10 software. Based on the curve, the average pull force for each run is calculated. The average load of five runs is used to represent the dispensing force of a given 15 roll. Only the first 23 to 25 sheets from the roll were used to obtain the measurement.

Table I sets out types of wet sheets and their properties. In Example 1, the solution was a sufficient amount of commercial (no salt) solution such as that which is used in the commercially available KLEENEX® brand 20 COTTONELLE® flushable moist wipes product of Kimberly-Clark Corporation. In Example 2, the solution was a sufficient amount of 4% salt water solution such as a simple 4% salt water solution with other additives as disclosed in the examples of wet wipe applications discussed previously in the Background of Invention, all of which have been and are incorporated herein 25 by reference.

Table I

	Non-Dispersible Wet Wipe Example 1		Dispersible Wet Wipe Example 2	
Basis Weight	60 gsm		60 gsm	
Solution	commercial (no salt)		4% salt solution	
Solution Add on level	175%		228%	
Basesheet Converting	4.25" width		4.25" width	
Perforation Bond Spacing	0.11"		0.07"	
	Run Average	Run STDev	Run Average	Run STDev
Dry Basis Weight (gsm)	57	2	66	4
Wet Thickness (mm)	0.56	0.02	0.47	0.01
Sheet Count	99	0.7	99	1.1
Wet tensiles				
MD Tensile (g/in)	380	26	321	30
MD Stretch (% Elongation)	23	1.4	28	1.6
TEA (Ft-Lb/Sq.In)	0.96	0.06	1.02	0.07
CD Tensile (g/in)	329	28	287	29
CD Stretch (% Elongation)	28	1.8	34	3.5
TEA (Ft-Lb/Sq.In)	0.93	0.09	0.97	0.13
Detach (g/sheet)	752	21	853	34
% strain @ pk load	8	0.5	11	1.1

Table II contains additional data reflecting the properties of disposable wet wipes. This table shows the effects that changing base sheet and solution variables has on the physical properties of the wipes. The pulp used to make these sheets was Weyerhaeuser CF 405. For this example, the binder was example Code E, Table 15, of serial no. 09/564,531. This binder material had a molecular weight of 610,000 and was made from the following monomers provided in the following weight percents: 60% acrylic acid, 24.5% butacrylic acid, 10.5% 2-ethylhexyl-acrylic acid, and 5% AMPS (2-acrylamido-2-methyl-1-propanesulfonic acid).

Table II

Basesheet Variables	100% pulp / 65gsm	100%pulp / 60gsm	100%pulp / 55gsm	15%PET / 55gsm
	22% binder/ 1.1 mm dry thickness	20% binder/ .76 mm dry thickness	20% binder/ .76 mm dry thickness	20% binder/ .84 mm dry thickness
Solutions	0.5% silicone; 0.25% lanolin			
	Example 3	Example 4	Example 5	Example 6
MD Wet Tensile (g/1")	500	452	383	391
CD Wet Tensile (g/1")	445	403	344	310
wet thickness (mm)	0.46	0.40	0.39	0.41
peel force	167	131	106	
Solutions	1.0% silicone; 0.25% lanolin			
	Example 7		Example 8	Example 9
MD Wet Tensile (g/1")	473		401	416
CD Wet Tensile (g/1")	455		348	350
wet thickness (mm)	0.45		0.40	0.39
peel force	170		120	115
Solutions	1.0% silicone; 0.0% lanolin			
	Example 10			
MD Wet Tensile (g/1")	528			
CD Wet Tensile (g/1")	462			
wet thickness (mm)	0.44			
peel force	162			

Table III sets out the physical properties of rolls of wet wipes and
 Table IV sets out the theoretical physical properties of rolls of wet wipes.

Table III - Coreless Roll Measurements and Calculations

Roll	Measured	Unwound	Calculated	Calculated	
Number	Diameter	Wet	Roll	Effective	Compression
	(inches)	Thickness	Density	Thickness	Factor
		(mm)	(g/cm ³)	(mm)	(%)
1	2.77	NA	0.621	0.340	71%
2	2.83	0.41	0.595	0.355	74%
3	2.86	NA	0.583	0.362	76%
4	2.90	NA	0.567	0.373	78%
5	2.96	0.478	0.544	0.388	81%
6	2.86	NA	0.583	0.362	76%
7	2.98	NA	0.537	0.393	82%
8	2.88	NA	0.575	0.368	77%
9	2.94	NA	0.552	0.383	80%
10	2.86	0.448	0.583	0.362	76%
11	2.86	NA	0.583	0.362	76%
12	2.84	NA	0.591	0.357	74%
13	3.00	NA	0.530	0.399	83%
14	2.86	NA	0.583	0.362	76%
15	2.86	NA	0.583	0.362	76%

Initial sheet length = 5 inches

Initial sheet width = 4.125 inches

Number of sheets in roll = 90

Dry basesheets basis weight = 65 gsm

Target solution add-on = 225 %

Calculated roll weight = 253 grams

Assumed wet thickness prior to winding = 0.48 mm

Compression factor = calculated effective thickness (wound)/assumed wet thickness prior to winding

Calculated Roll Density = $\text{weight} / \pi d^2 / 4 \times \text{width}$ (calculated roll weight / $\pi \cdot \text{measured diameter}^2 / 4 \cdot \text{initial sheet width}$)

Calculated Effective Thickness - calculated thickness of sheet in roll under pressure of winding.

Table IV - Theoretical Roll Density Possibilities

Dry		Calculated	Assumed	Assumed	Calculated	Calculated	
Basesheet	Solution	Roll	Pre-wound	Compression	Roll	Roll	
Weight	Add-on	Weight	Wet Thickness	Factor	Diameter	Density	Footnote
(gsm)	(%)	(grams)	(mm)	(%)	(inches)	(g/cm ³)	
65	225	253	0.48	1.300	3.75	0.34	(1)
65	225	253	0.48	1.150	3.53	0.38	
65	225	253	0.48	1.000	3.29	0.44	(2)
65	225	253	0.48	0.900	3.12	0.49	
65	225	253	0.48	0.800	2.94	0.55	
65	225	253	0.48	0.710	2.77	0.62	(3)
65	225	253	0.48	0.600	2.55	0.73	
65	225	253	0.48	0.500	2.33	0.88	(4)
65	225	253	0.48	0.440	2.18	1.00	
65	225	253	0.48	0.405	2.09	1.09	(5)
65	300	311	0.48	1.300	3.75	0.42	
65	300	311	0.48	1.150	3.53	0.47	
65	300	311	0.48	1.000	3.29	0.54	
65	300	311	0.48	0.900	3.12	0.60	
65	300	311	0.48	0.800	2.94	0.68	
65	300	311	0.48	0.700	2.75	0.77	
65	300	311	0.48	0.600	2.55	0.90	
65	300	311	0.48	0.500	2.33	1.08	
50	225	195	0.48	1.300	3.75	0.26	
50	225	195	0.48	1.150	3.53	0.29	
50	225	195	0.48	1.000	3.29	0.34	
50	225	195	0.48	0.800	2.94	0.42	
50	225	195	0.48	0.600	2.55	0.56	
50	225	195	0.48	0.400	2.08	0.85	
50	225	195	0.48	0.313	1.84	1.08	
50	150	150	0.48	1.300	3.75	0.20	(6)
50	150	150	0.48	1.000	3.29	0.26	
50	150	150	0.48	0.800	2.94	0.33	
50	150	150	0.48	0.600	2.55	0.43	
50	150	150	0.48	0.400	2.08	0.65	
50	150	150	0.48	0.300	1.80	0.87	
50	150	150	0.48	0.240	1.61	1.09	

Initial sheet length = 4.5 inches

Initial sheet width = 4.125 inches

Number of sheets in roll = 100

Total roll length = 37.5 feet

Footnotes - Table IV

- (1) A very loose roll, no compression, lots of air spaces, giving an overall low density
- (2) A roll that theoretically has no compression; this density and volume for roll vs. unrolled would be equal
- (3) A roll that has been produced, with this compression and roll density
- (4) Estimate of maximum compression achievable before product failure from in-wound tension exceeding strength of sheets or perforations
- (5) Physical limitation of the maximum density achievable based on incompressibility of water
- (6) Low end density achieved by a loose roll, low dry basis weight and low %Add-on

5 The dispensing force should be ideally considerably less than the detach force for a roll of perforated wipes. In this way it is assured that the wipes will be able to be pulled from, or removed from, the dispenser without inadvertently breaking the perforation. Thus, a dispensing force of from about 100g to about 600g is contemplated, a dispensing force of from about 150g to 250g is further contemplated and ideally a dispensing force of less than 200g is desirable, with forces based on g/4.25 inches (g/108.0 mm). Normalized, these forces are 23.5 g/inch (0.93 g/mm) to 141.2 g/inch (5.56 g/mm), 35.3 g/inch (1.39 g/mm) to 58.8 g/inch (2.32 g/mm), and 47.1 g/inch (1.85 g/mm).

10 Generally a peel force of from 80g - 300g (per 4.25 inches, 108.0 mm) is contemplated, although lower peel forces may be obtained with different types of wipe products. The cartridge adds minimal resistance to the roll as it is unwound. Thus, the force required to unwind a roll is not materially increased by the cartridge. The roll or stack of wipes may also be placed directly in the tray for dispensing, without the use of a cartridge.

15 Figure 19 shows the roll 34 as it is placed in a cartridge in a dispenser. The spiral line 38 is intended to represent the manner in which the roll is wound and depicts in that configuration a roll that is being unwound from the bottom. That figure further shows the relationship of the wiper 10 to the wet web. Figure 20 shows the roll 34 in cartridge 11, with spiral line 38 indicating the wind of the roll. This figure shows the relationship of the roll and the ribs 32. As can be seen from this figure the roll is lifted off of the side and bottom walls of the cartridge by rib 32. Thus, the amount of surface area of the roll that is in contact with the cartridge is reduced. This in turn reduces the drag that the roll experiences from friction with the cartridge when the roll is turned.

Figure 21 shows a portion of a cartridge 11, the lip 31 of the cartridge, and the side walls 39 and 40. The angle at which the cartridge is positioned has an effect on how well the dispenser will perform. The angle will have a tendency to increase or reduce the drag associated with pulling the wipe out. It will have an effect on the amount of siphoning, wicking or drying that may take place in the wet wipe. It may also have an effect on how the roll acts as it is unwound, becoming smaller and smaller in the cartridge. The angle of the cartridge can be measured by the angle that the lip 31 forms with a true vertical axis, shown as 42. For a dispenser system as shown in Figures 1-19, the angle 43 that the lip 31 has with a true vertical axis 42 should be from about 10 degrees to about 80 degrees, from about 20 degrees to about 70 degrees, at least greater than 20 degrees, at least smaller than 60 degrees, and preferably about 30 degrees.

Further the angle may be selected such that it balances the forces between the peel forces associated with unrolling the roll and the weight of the roll forcing it down against the ribs. Thus the wipe can be unrolled without having excessive movement of the roll within the cartridge, which in turn overcomes the tendency of the roll to translate toward the gap and bind or jam the dispenser. Additionally, the selection of the angle may play a role in reducing the drying of the wet wipe. As the angle 43 is increased the difference between the height of the top of the roll and the tail is decreased, thus decreasing any siphoning driving force.

Figures 22 through 25 show various views of an example of a cover. In this example the cover 7 has cover mounts 29, a recess 5 for forming part of a finger hold indentation, an inside rim 33, which has a top inside rim section 45 and side inside rim sections 46 (of which only one can be seen in Figure 24), leg sections 72, and posts 44. In this example the posts are used to connect the wiper to the cover.

Figures 26 through 28 show an example of a tray 3a. In this example the tray has an opening 15a with 3 recesses on both sides. The tray has guides that are rollers 47.

In a further example of the tray, the tray is fixed to the housing. This may be accomplished by having the housing and tray being made out of a single piece of material or having the housing and tray joined together by a permanent bonding means, such as welding, heat bonding or gluing. In yet a further example the tray may be attached to the housing so that it cannot rotate with respect to the housing, yet still may be removable.

Figure 29 shows the rollers 47 used in the tray 3a shown in Figures 26-28. The rollers have raised surfaces 67 and lowered surfaces 68. The raised and lowered surfaces of the rollers as well as any guide may also be a ridge or a rim. As the raised or lowered surfaces become narrower, i.e., become sharper, care must be taken not to cut the wet web.

Wiper blades may be made out of any flexible material, such as thermoplastic elastomers, foam, sponge, plastic, or rubber having a shore A durometer hardness value ranging about 0 to 80, from about 15 to about 70 and preferably from about 30 to about 60. It is further preferred that the wiper blades be made from a material that will form a good moisture and contamination barrier. Examples of preferred types of material are SANTOPRENE®, Kraton®, silicone, or styrene ethylene/butylene styrene (SEBS). The wiper blade is designed to function with the guides and the tray and to a limited extent the lip of the cartridge. Depending on the placement of the wiper, it could have greater or lesser interaction with these components of the dispensing system. The gap between the end of the wiper blade and the tray may be varied depending upon the thickness of the wet wipes and how much drag is need for the dispensing system to function as desired. The wiper blade can help to hold the tail of the wipe in place and thus keep the tail from falling back through the gap and into the cartridge. The wiper blade material has a Gurley stiffness value (ASTM D 6125-97) between about 100 mg and 8000 mg, preferably between about 200 mg and 6000 mg, and more preferably between about 400 mg and 3000 mg.

The force applied to the wipe by the wiper blade when pulling the wipe from the dispenser should not be greater than the tensile strength of the wipe in the non-perforated region and not greater than the perforation tensile

strength of a perforated wipe. If the wipes are made such that they are dry in storage and become wet during use, the blade may be configured to exert pressure on the wipe. In this case, the dispensing of a sheet or sheets causes sufficient shear to be applied to the wipe to permit the moisture to be released. For example, this force or shear may be sufficient to cause microcapsules of fluid to burst or may be sufficient to rupture a protective emulsion which contains the fluid.

Figures 32 through 37 show an example of a wiper assembly. In this example the wiper assembly 10 comprises a chassis 48, and a blade 50 that has fingers 49. In this example the fingers are designed to cooperate with the lowered surfaces 16b (Figure 2A) of the guides on the housing. In this example the blade is made of SANTOPRENE® and the chassis is made of polypropylene.

Figures 38 through 39 show an example of a wiper blade. In this example the wiper blade is formed of a single piece (see Figure 38) of material that is folded over to form the wiper blade (see Figure 39). The wiper blade has raised portions 51 that reduce the amount of surface area of the wiper blade that contacts the sheet and raised areas 53 and lowered areas 52 that cooperate with the raised and lowered areas of the guides.

Figures 62 to 65 illustrate dispensers 1 that have a rounded member 95 or rounded ridges 96. These components are shown as being part of or attached to the wiper blade assembly 99 and adjacent the wiper blade 74. These components prevent or reduce the tendency of the roll from binding in the gap as the size of the roll decreases.

Figures 57 through 61 show an example of a wiper assembly. In this example the wiper comprises a chassis 73, and a wiper blade 74 (74a shows sections of blade engaging and protruding through the chassis) that has fingers 75. In this example the fingers are designed to cooperate with the lowered surfaces of the guides 16 in the dispenser. In this example the blade is made of SANTOPRENE® and the chassis is made of polypropylene. This embodiment contains raised or thicker areas 97 of the wiper. These raised areas cooperate with the guides 16 on the tray.

Figures 69 through 91 show examples of a wiper blade assembly 110. In these examples, the assembly comprises a chassis 112 and a wiper blade 114, which mate together to form the wiper. The chassis comprises a handle 116 and a plurality of openings 118 for receiving the wiper blade. The blade comprises a tab 120 and a plurality of buttons 122. The buttons have a diameter that is slightly larger than the diameter of the openings. Since the wiper blade, including the buttons, is made of a compressible material, the buttons can be squeezed through the openings to removably attach the blade to the chassis. The blade is prevented from falling out of the chassis due to the increased diameter of the buttons relative to the openings. The tab 120 fits into the slot 124 (Figure 81) of the handle 116 when the blade and chassis are mated together. The blade can be removed from the chassis by pulling the tab away from the chassis and applying sufficient force such that the buttons are compressed and pass through the openings.

Referring to Figures 69 to 71 and 73 to 85, the chassis further comprises mounting elements in the form of collars 126. These collars mate with posts 44 on the cover (Figure 24) to mount the wiper blade assembly to the cover. The collars are arranged such that the chassis can be mounted to the posts in only one orientation. The chassis also comprises an arcuate side 128, which has a similar curvature to that of the inside of the cover, further stabilizing the wiper blade assembly in the dispenser. The chassis may be mounted to the cover such that the assembly can be removed. For example, the assembly can be removed for replacement, for cleaning, and/or for adjustment of the dispensing characteristics of the dispenser. The handle 116 is useful for manipulating the assembly, and for mounting it to and removing it from the dispenser.

To mount the wiper or chassis to the dispenser, it is preferred that the collars are pushed to the base of the posts. That is, the chassis is preferably in contact with the inside of the cover. The cover may have a single post, or it may have a plurality of posts. In the example shown in Figure 24, the cover has four posts. The wiper may have a single collar, or it may have a plurality of collars. In Figures 69 to 71 and 73 to 85, the chassis has four collars. The

number of collars is not necessarily equal to the number of posts. A wiper may have more collars or fewer collars than the number of posts on a cover. Also, the dispenser and the wiper may be configured such that the wiper has at least one post and the dispenser has at least one collar. This configuration provides for the wiper to be mounted to the dispenser or cover by mating the post and collar.

The chassis further comprises rounded fins 130, which extend from the main body of the chassis. When the chassis is mounted to the cover and the cover is closed, the fins point toward the interior of the dispenser. These fins inhibit the roll from binding or cinching in the gap, especially as the size of the roll decreases. This effect can also be obtained by equipping a wiper blade with a rounded member 95 or rounded ridges 96 (Figures 62 to 65), or by utilizing fins, ridges, or members that are wedge shaped (Figure 91-C). These fins, ridges, or members are collectively referred to as tensioners. The tensioner can be made of a rigid material or a flexible material. A tensioner on the wiper blade assembly serves to block the roll from interacting with the gap as the tail of the wipe is pulled from the dispenser. That is, the tensioner maintains the roll in a position away from the gap.

The tensioner provides for an improved efficiency in dispensation of wipes. Since the roll is hindered from becoming cinched in the gap, the roll can be unwound more fully, and more wipes can be easily dispensed from the roll. Without being bound by any theory of operation it is thought that, as the roll is made smaller and less massive by the process of unwinding, the smaller roll has a decreased ability to fall back into the dispenser. That is, the smaller roll tends to translate toward the gap as sheets are dispensed. The smaller roll, which contains the sheets that were at the center of the parent roll, is referred to as a cigarette. If the cigarette becomes wedged or cinched in the gap, the sheets in the cigarette are retained in the dispenser. That is, those sheets cannot be dispensed by pulling the tail of the cigarette through the gap. A tensioner serves to maintain the cigarette away from the gap even as the tail of the cigarette is being pulled through the gap. This is illustrated schematically in Figures 91 A-C.

For a roll of wet wipes as described above, divided into sheets by lines of perforations at 120 mm intervals, and removed from a dispenser one sheet at a time, the absence of a tensioner can allow a cigarette 144 to become wedged in the dispenser between the wiper and the tray. This cigarette can have as many as 6 to 8 sheets connected. The diameter of such a cigarette is approximately 15 mm. The tensioner helps to prevent this wedging or cinching, even for rolls substantially smaller than 15 mm, more preferably smaller than 10 mm. For removal of a roll of wet wipes from a dispenser equipped with a tensioner, a cigarette 144 that becomes wedged between the wiper and the tray typically has only 2 sheets connected. The diameter of such a cigarette is approximately 8 mm.

Referring to Figures 69 to 77 and 86 to 90, the wiper blade is configured to coordinate with the fins on the chassis. The buttons are positioned on arms 132 which are separated from each other to allow the fins to protrude between them. The wiper blade may further comprise fingers 134 and raised areas 136 to cooperate with the raised and lowered areas of the guides. The blade may also comprise planar areas 140, which are positioned lower than the middle planar area 142. This extended length of the blade on the distal ends assists in the retention of the moisture content of the wet wipes. Also, the extended length helps to reduce skating of the wipe from side to side as it is pulled from the dispenser.

Any method of attaching the wiper blade to the chassis, or of attaching the chassis to the cover, may be used. For example, they may be attached by the use of an adhesive or by the use of engaging brackets, pressure mountings, or tongue and groove. These methods of attachment may result in the permanent securing of the components to each other or may provide for removable attachment. Likewise, the tensioner may be removably attached to the wiper blade and/or the chassis, or it may be permanently attached. The tensioner may be integral with the blade and/or chassis.

Figures 40 and 41 show an example of a roller bar for toilet tissue. This example comprises a first roller housing 80, a second roller housing 81

and a spring 82. Figures 55 through 56 show other embodiments of the dispenser.

Figures 42 through 45 show an example of a mounting assembly. This mounting assembly comprises slide arms 55 and 56, housings 57 and 58, end openings 59, and springs 61. The slide arms have stops 60 that cooperate with stops 83 to limit the maximum longitudinal extension of the slide arms. The mounting assembly has a third housing 84 that has tabs 63 that cooperate with openings 62 to secure the housings 57 and 58 to housing 84. Housing 84 further has a threaded passage 64 for receipt of a screw. Figure 44 shows the mounting assembly with the slide arms in a retracted position, while Figure 45 shows the mounting assembly with the slide arms in an extended position. In one embodiment, the length of the mounting assembly in the retracted position is about 3.5 inches (88.9 mm), and the length of the mounting assembly in the extended position the length is about 8 inches (203.2 mm). Preferably the length of the mounting assembly in the retracted position is about 5 inches (127.0 mm), and the length of the mounting assembly in the extended position the length is about 6.5 inches (165.1 mm). The three housing design may also be simplified into a two housing embodiment or a single housing embodiment. In the two housing embodiment, top and bottom or side and side halves are fixed together to hold the spring and slide arms.

The assembly is held in place by having the ends out the side arms positioned in holes in the object that the dispenser is to be attached to, for example the holes in a toilet paper dispenser mounted into a wall. The springs keep the slide arms extended and thus hold them in the holes. A screw is then inserted through the dispenser and the passage 64 and tightened down, forcing the end engagement surfaces 90 against the wall of the holes in the toilet tissue dispenser.

Figure 66 depicts a conventional bath tissue holder 85 that is the partially recessed type, having posts 86. Figure 67 depicts a conventional bath tissue holder 85 that is not recessed and having posts 86 and a roller 6. Figure 68 illustrates the holder of Figure 67 with the roller removed and a

mounting assembly 8 engaged with the post 86. In actual use the mounting assembly would be joined with a dispenser, as shown for example in Figure 2.

The mounting assembly should be made out of material that is strong enough to withstand the forces that are placed on it to hold the dispenser in place. The material should have enough strength to withstand the forces that the screw will place on the treaded passage. Examples of materials that may provide these features and be used to make the mounting assembly are 15% or more glass filled Pbt, ABS or any material having similar strength properties.

Figures 46 to 50 show an example of a screw 9 that cooperates with a mounting device, such as the example shown in Figures 42 – 45. The screw should be made of material that meets the same strength requirements as set out for the mounting assembly. In this example the screw has a thread design that requires 6 turns to move it 1 inch (25.4 mm). Standard ACME conventional screw threads require 23 turns to move it 1 inch (25.4 mm). This thread design provides greater ease for the user to attach the dispenser because it requires less turns of the screw to do so. In this example the screw additionally has a large head, with a groove 65 and grips 66. The groove can fit a coin or screwdriver. The larger head of the screw and the groove, however, are not necessary, although they may be preferred to provide greater ease to install the dispenser system. The screw may further be provided with a lock nut or jam nut near the head to prevent loosening of the screw after it is tightened.

Alternative mountings may also be employed. These mountings may be fixed or removable. They may include by way of example such fastening systems as cable ties, wing nuts, anchor bolts, click and grooves and snap and lock mechanisms.

Figures 51 – 53 show an example of a cartridge. In this example the cartridge has protrusions 69 on its side walls.

Figure 54 shows an example of a package of cartridges. In use this package would be filled with rolls of wet wipes, one for each cartridge. The cartridges would then be sealed, by placing a totally or partially removable

cover over the lips 31. The seal is preferably moisture and bacterial resistant. The consumer would then purchase the package and remove a cartridge, open the dispenser and place the cartridge in the dispenser. The top of the cartridge or the slit in the cover can be removed either before placing the
5 cartridge in the dispenser or after it is inserted in the dispenser. The end of the roll of wet wipes is then pulled out and over the tray and guides and the cover is then closed, thus providing an efficient system for dispensing wet
wipes.

WE CLAIM:

1. A wiper assembly for a wipes dispenser comprising:
a chassis; and
a wiper blade.
- 5 2. The assembly of claim 1, wherein the wiper blade and chassis
are integral.
3. The assembly of claim 1, wherein the wiper blade and chassis
are connected by an adhesive.
- 10 4. The assembly of claim 1, wherein the wiper blade is removably
attached to the chassis.
5. The assembly of claim 4, wherein the wiper blade comprises at
least one button, and the chassis comprises at least one opening;
the button and opening coordinating to attach the wiper blade to
the chassis.
- 15 6. The assembly of claim 5, wherein the diameter of the button is
greater than the diameter of the opening.
- 20 7. An assembly comprising:
a wiper assembly; and
a wipes dispenser;
the wiper assembly comprising a chassis and a wiper
blade;
the dispenser comprising wipes and a gap;
the wipe comprising a tail;
the wipes capable of being removed from the dispenser
25 by pulling the tail through the gap.
8. The assembly of claim 7, wherein the chassis comprises at least
one collar; and

the dispenser comprises at least one post;
the collar and post coordinating to mount the chassis to the
dispenser.

5 9. The assembly of claim 7, wherein the wiper blade comprises
fingers; and
the dispenser comprises guides;
the fingers and guides coordinating to secure the tail of the
wipes.

10 10. The assembly of claim 9, wherein the fingers comprise raised
areas.

11. The assembly of claim 7, further comprising a tensioner.

15 12. The assembly of claim 11, wherein the wipes are configured in a
roll comprising sheets;
the roll capable of being unwound as the wipes are removed,
such that less than 6 sheets are retained in the dispenser.

13. The assembly of claim 12, wherein less than 4 sheets are
retained in the dispenser.

14. The assembly of claim 12, wherein less than 3 sheets are
retained in the dispenser.

20 15. The assembly of claim 12, wherein less than 2 sheets are
retained in the dispenser.

16. The assembly of claim 12, wherein the sheets retained in the
dispenser are configured in a roll having a diameter less than 15 mm.

25 17. The assembly of claim 16, wherein the diameter is less than 10
mm.

18. The assembly of claim 16, wherein the diameter is less than 8 mm.
19. The assembly of claim 11, wherein the tensioner is a plurality of fins.
- 5 20. The assembly of claim 11, wherein the tensioner is a plurality of rounded ridges.
21. The assembly of claim 11, wherein the tensioner is a rounded member.
22. The assembly of claim 11, wherein the tensioner is a wedge.
- 10 23. A wiper assembly for a wipes dispenser comprising:
a wiper blade; and
a tensioner.
24. The assembly of claim 23, wherein the tensioner is a plurality of fins.
- 15 25. The assembly of claim 23, wherein the tensioner is a plurality of rounded ridges.
26. The assembly of claim 23, wherein the tensioner is a rounded member.
27. The assembly of claim 23, wherein the tensioner is a wedge.
- 20 28. The assembly of claim 23, further comprising a chassis;
wherein the chassis can be mounted to a dispenser.
29. An assembly comprising:
a wiper assembly; and
a wipes dispenser;
- 25 the wiper assembly comprising a wiper blade and a tensioner;

the dispenser comprising a roll of wipes and a gap,
the wipes comprising a tail;
the wipes capable of being removed from the dispenser
by pulling the tail through the gap.

5 30. The assembly of claim 29, wherein the wiper blade comprises
fingers; and
the dispenser comprises guides;
the fingers and guides coordinating to secure the tail of the
wipes.

10 31. The assembly of claim 30, wherein the fingers comprise raised
areas.

32. The assembly of claim 29, wherein the roll is capable of being
unwound as the wipes are removed, such that less than 6 sheets are retained
in the dispenser.

15 33. The assembly of claim 32, wherein less than 4 sheets are
retained in the dispenser.

34. The assembly of claim 32, wherein less than 3 sheets are
retained in the dispenser.

20 35. The assembly of claim 32, wherein less than 2 sheets are
retained in the dispenser.

36. The assembly of claim 32, wherein the sheets retained in the
dispenser are configured in a roll having a diameter less than 15 mm.

37. The assembly of claim 36, wherein the diameter is less than 10
mm.

25 38. The assembly of claim 36, wherein the diameter is less than 8
mm.

39. The assembly of claim 29, wherein the roll is maintained away from the gap by contact with the tensioner when the tail is pulled through the gap.

5 40. A dispenser for wipes comprising:
a roll of wipes; the roll comprising a tail;
a wiper assembly; the wiper assembly comprising a chassis, a wiper blade, and a tensioner;
a cover; the cover comprising at least one post; and
a gap.

10 41. The dispenser of claim 40, wherein the chassis comprises at least one collar;
the collar and the post coordinating to mount the chassis to the cover.

15 42. The dispenser of claim 40, wherein the tensioner is a plurality of fins.

43. The dispenser of claim 40, wherein the tensioner is a plurality of rounded ridges.

44. The dispenser of claim 40, wherein the tensioner is a rounded member.

20 45. The dispenser of claim 40, wherein the tensioner is a wedge.

46. The dispenser of claim 40, wherein the wipes can be removed from the dispenser by pulling the tail through the gap.

25 47. The dispenser of claim 46, wherein the roll is capable of being unwound as the wipes are removed, such that less than 6 sheets are retained in the dispenser.

48. The dispenser of claim 47, wherein less than 4 sheets are retained in the dispenser.

49. The dispenser of claim 47, wherein less than 3 sheets are retained in the dispenser.

50. The dispenser of claim 47, wherein less than 2 sheets are retained in the dispenser.

5 51. The dispenser of claim 47, wherein the sheets retained in the dispenser are configured in a roll having a diameter less than 15 mm.

52. The dispenser of claim 51, wherein the diameter is less than 10 mm.

10 53. The dispenser of claim 51, wherein the diameter is less than 8 mm.

54. The dispenser of claim 40, wherein the chassis and tensioner are integral.

55. The assembly of claim 40, wherein the wiper blade is removably attached to the chassis.

15 56. The assembly of claim 55, wherein the wiper blade comprises at least one button, and the chassis comprises at least one opening;
the button having a diameter greater than the diameter of the opening; and
the button and opening coordinating to attach the wiper blade to
20 the chassis.

57. A method for dispensing wipes comprising:
providing wipes in a dispenser;
the wipes comprising a tail;
the dispenser comprising a wiper assembly and a gap;
25 and
the wiper assembly comprising a tensioner;
pulling the tail from the dispenser through the gap; and

maintaining the wipes away from the gap by contact with the tensioner.

58. The method of claim 57, wherein the wipes are configured in a roll, the roll comprising a cigarette.

5 59. The method of claim 58, wherein the roll comprises sheets, the sheets defined by lines of perforation separated by a distance of about 114 mm to about 127 mm.

60. The method of claim 59, wherein the lines of perforations are separated by a distance of about 120 mm.

10 61. The method of claim 59, wherein the pulling the tail from the dispenser comprises unwinding the roll of wipes.

62. The method of claim 61, wherein the cigarette is retained in the dispenser.

15 63. The method of claim 62, wherein the cigarette comprises less than 6 sheets.

64. The method of claim 62, wherein the cigarette comprises less than 4 sheets.

65. The method of claim 62, wherein the cigarette comprises less than 3 sheets.

20 66. The method of claim 62, wherein the cigarette comprises less than 2 sheets.

67. The method of claim 62, wherein the cigarette has a diameter less than 15 mm.

25 68. The method of claim 62, wherein the cigarette has a diameter less than 10 mm.

69. The method of claim 62, wherein the cigarette has a diameter less than 8 mm.

70. A dispenser for wipes comprising:
means for containing wipes;
the wipes comprising a tail; and
the means comprising a gap;
means for securing the tail of the wipes in the gap; and
means for preventing the wipes from wedging in the gap.

5

71. The dispenser of claim 70, wherein the wipes can be removed from the dispenser by pulling the tail through the gap.

10

72. The dispenser of claim 70, wherein the wipes are configured in a roll;

the roll comprising a cigarette;
the roll capable of being unwound as the wipes are removed;

15

and

the cigarette retained in the dispenser.

73. The dispenser of claim 72, wherein the cigarette has a diameter less than 15 mm.

74. The dispenser of claim 72, wherein the cigarette has a diameter less than 10 mm.

20

75. The dispenser of claim 72, wherein the cigarette has a diameter less than 8 mm.

76. A dispenser for wipes comprising:
a wiper assembly; the wiper assembly comprising a chassis, a tensioner, and at least one wiper mounting element; and
a cover; the cover comprising at least one cover mounting element;

25

the wiper mounting element and the cover mounting element coordinating to mount the wiper assembly to the cover.

77. The dispenser of claim 76, wherein the wiper mounting element is a collar, and the cover mounting element is a post.

5 78. The dispenser of claim 76, wherein the wiper mounting element is a post, and the cover mounting element is a collar.

79. The dispenser of claim 76, wherein the number of wiper mounting elements is equal to the number of cover mounting elements.

10 80. A wiper assembly for a wet wipes dispenser comprising:
a first means for mounting the assembly to the dispenser;
the first means comprising a first material;
a second means for contacting the wipes;
the second means comprising a second material;
the second material of the second means being more
15 flexible than the first material of the first means;
a means for reducing the evaporation of moisture from the wet
wipes in the dispenser; and,
a means for providing tension to the wet wipes so that the wipes
can be withdrawn from the dispenser in a continuous manner without binding
20 or tearing.

81. A wiper assembly for a wet wipes dispenser comprising:
a first section;
the first section having a length and a width, the length
being greater than the width;
25 the first section having a front surface and a back
surface, the back surface for positioning adjacent the dispenser;
the first section having a first opening and a second
opening; and
a second section;

the second section in contact with the top surface of the first section;

the second section having an extension;

the extension positioned in the second opening of the first section.

5

82. A wiper assembly for a wet wipes dispenser comprising:

a chassis;

the chassis comprising a top edge, a bottom edge, two side edges, a length, a width, a top surface and a back surface;

10

the chassis comprising a first and a second collar;

the collars being spaced apart and adjacent to the top edge;

the chassis comprising a plurality of openings; and

a blade;

15

the blade comprising a top surface and a back surface;

a portion of the back surface in contact with the top surface of the chassis;

the back surface comprising a plurality of buttons;

a portion of the blade extending below the chassis bottom

20

edge;

the buttons positioned in the openings; and

the blade comprising extending members, the extending members not being in contact with the surface of the chassis.

25

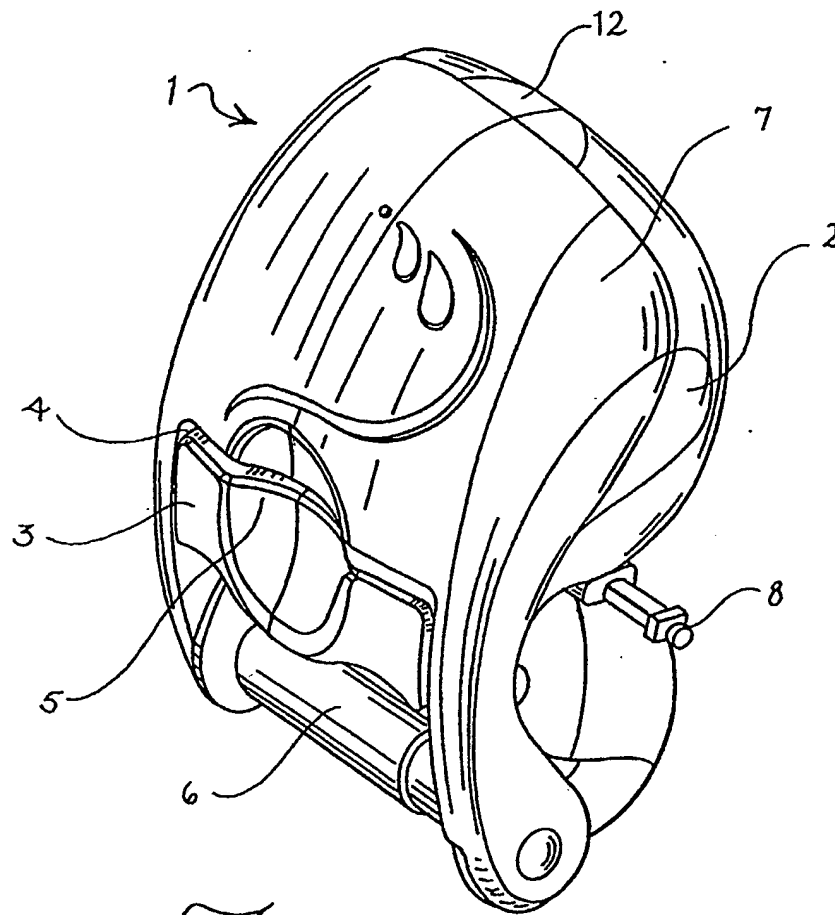


Fig. 1

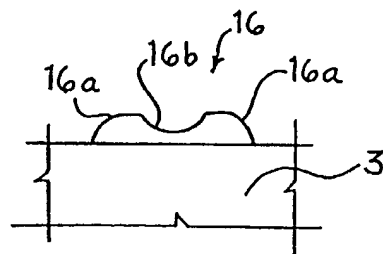


Fig. 2 A

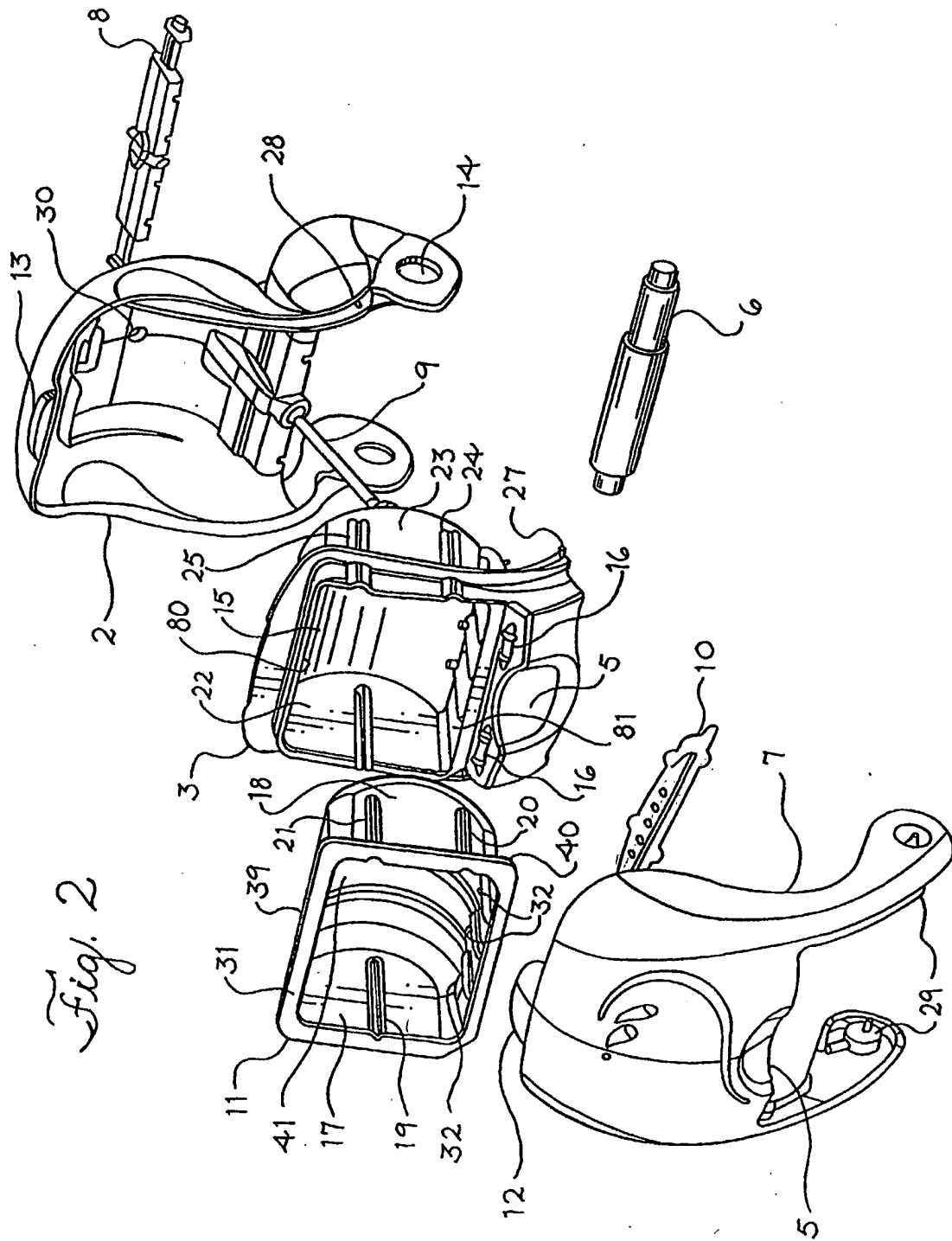
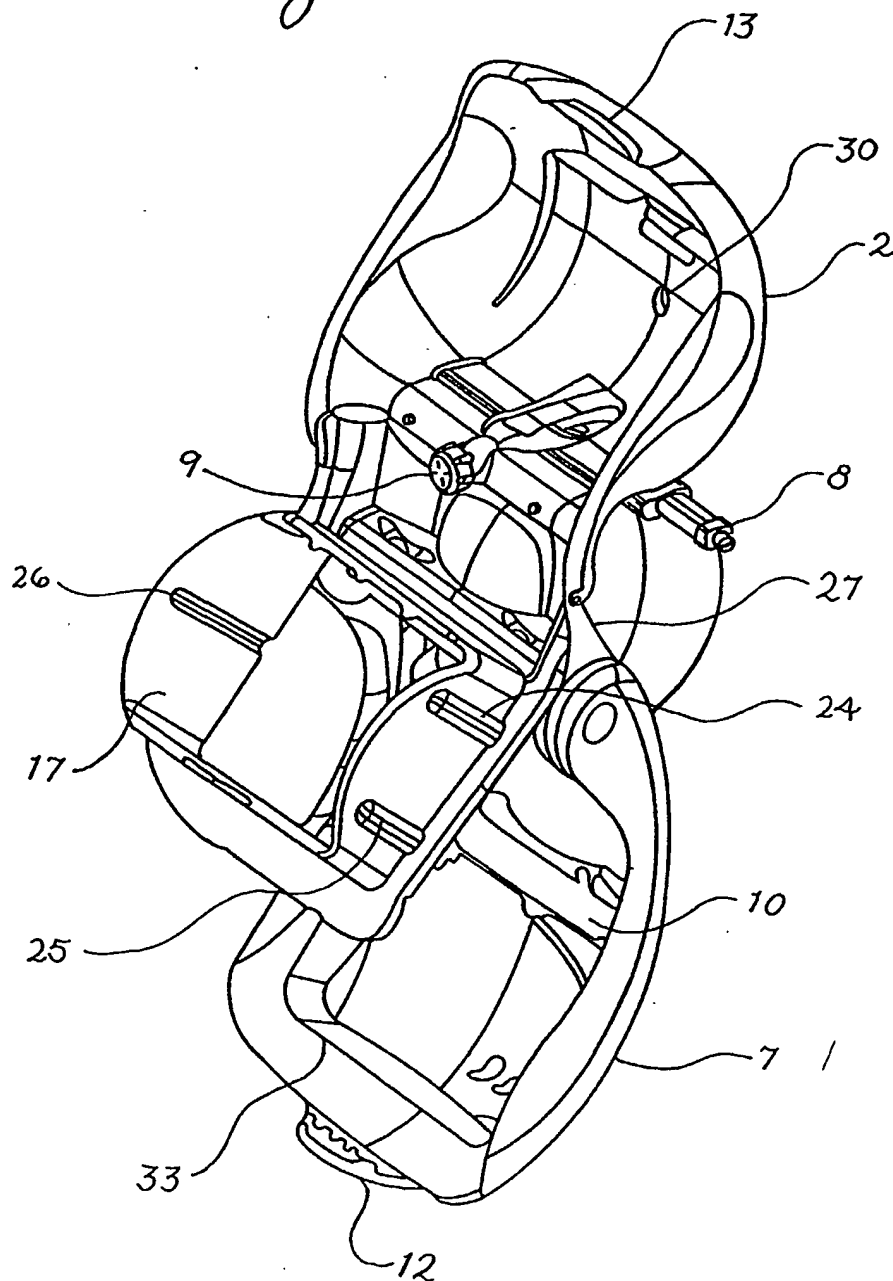


Fig 3



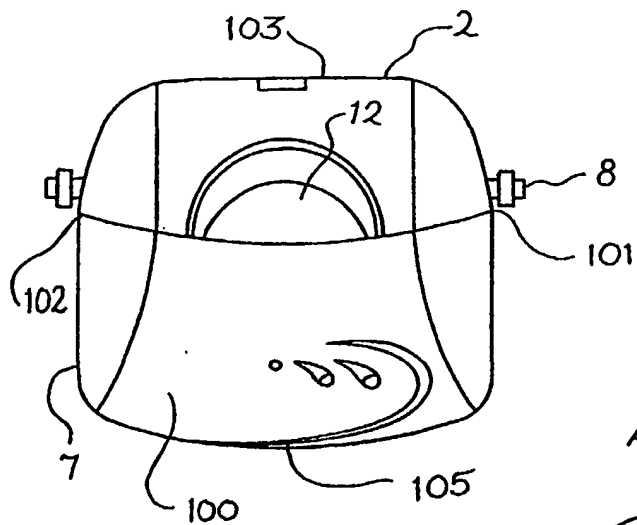
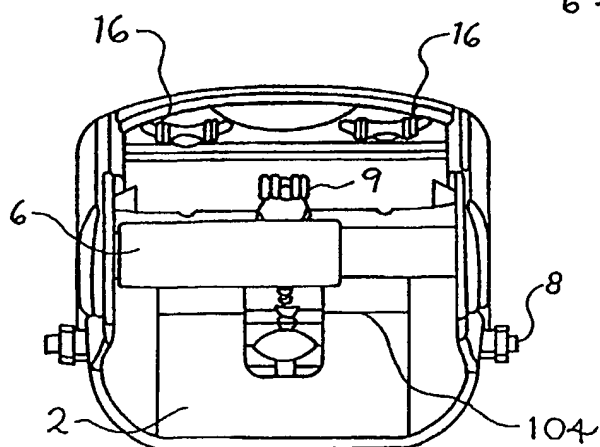
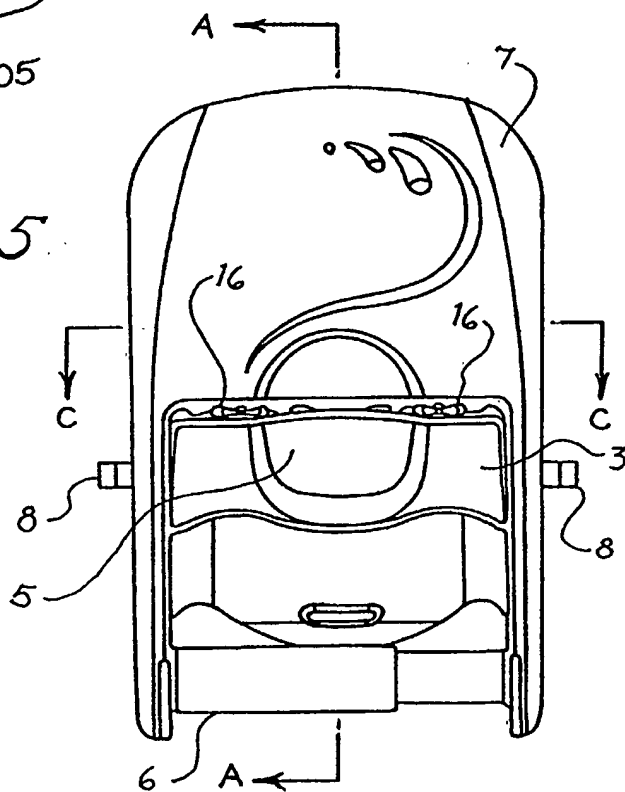


Fig. 5



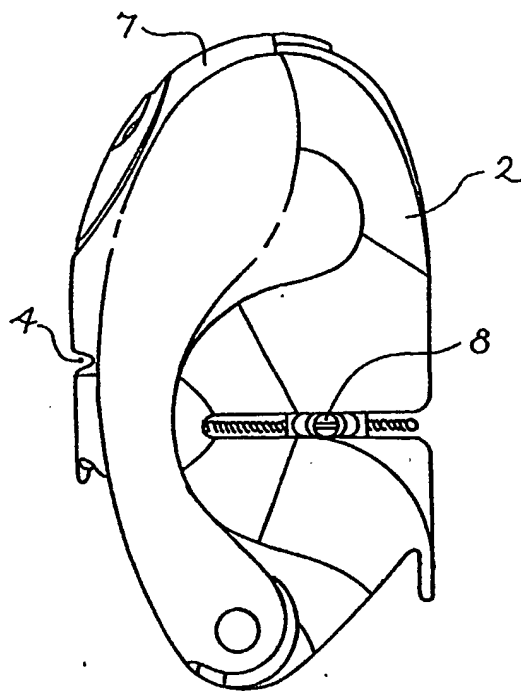


Fig. 7

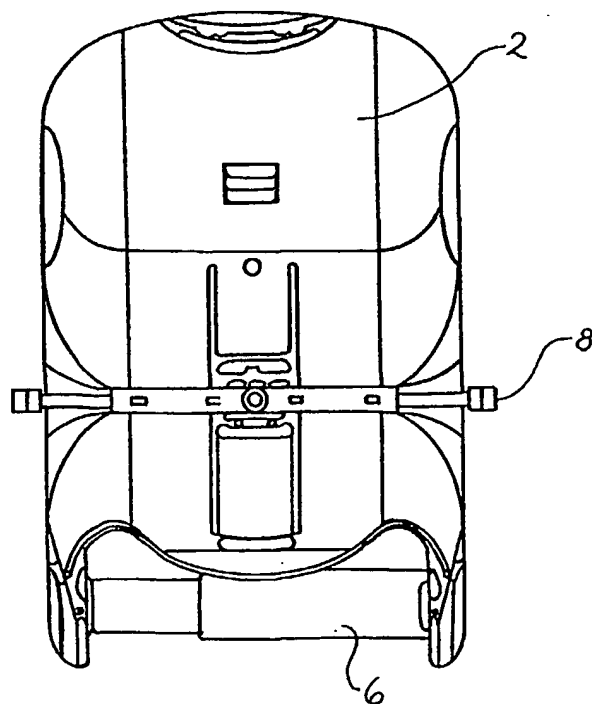


Fig. 8

Fig. 10

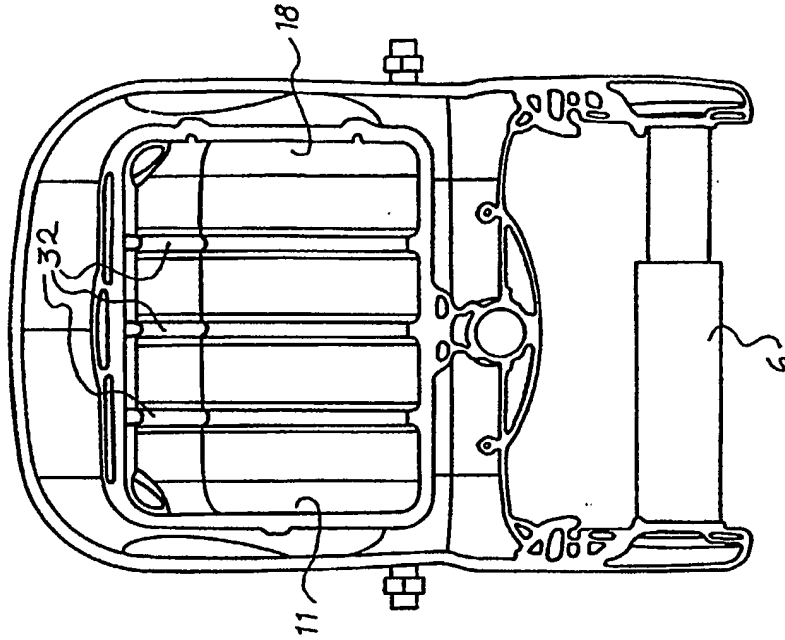


Fig. 9

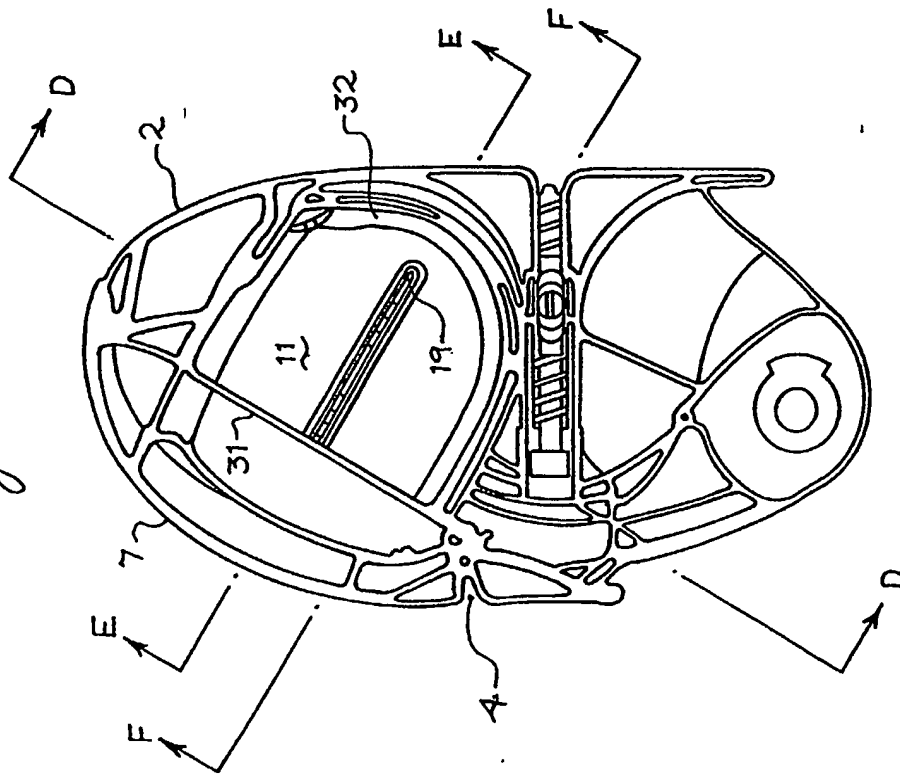


Fig. 11

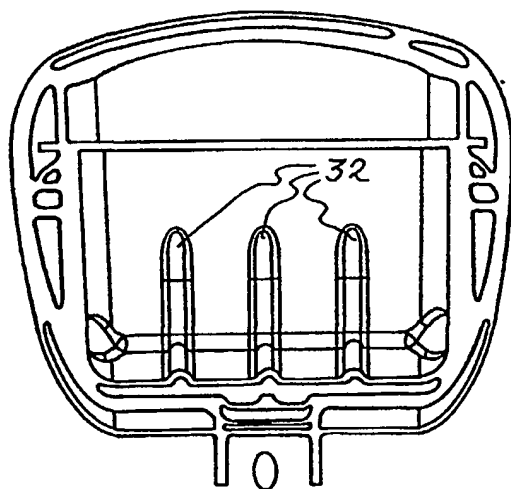
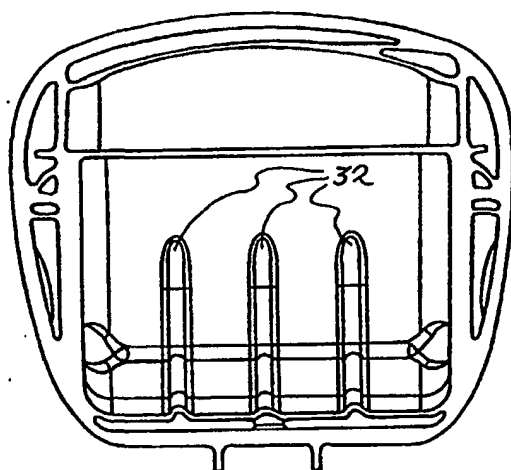


Fig. 12

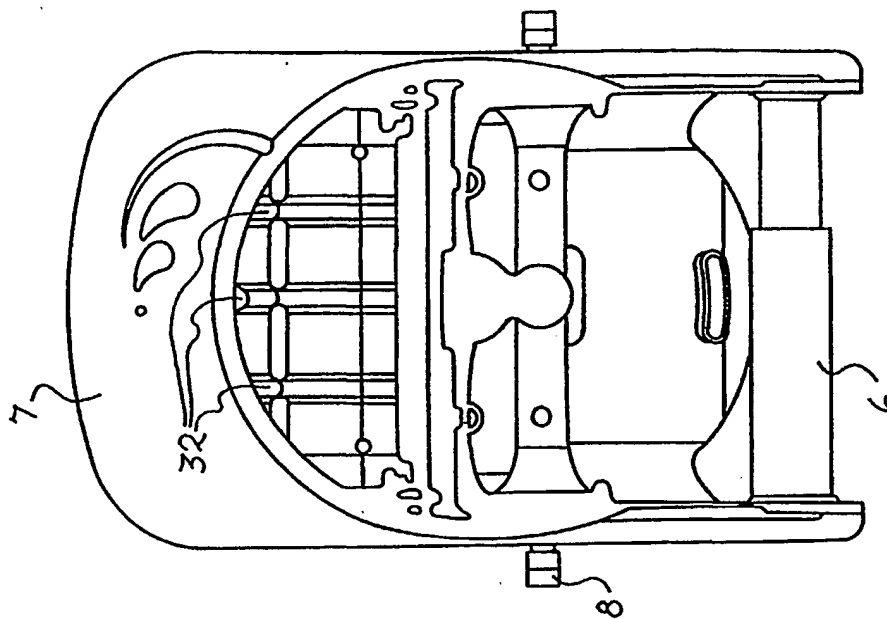


Fig. 14

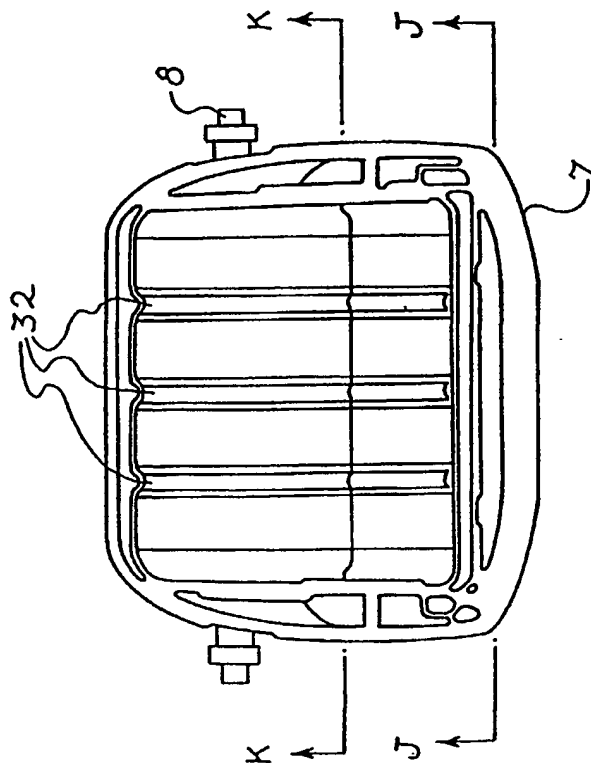
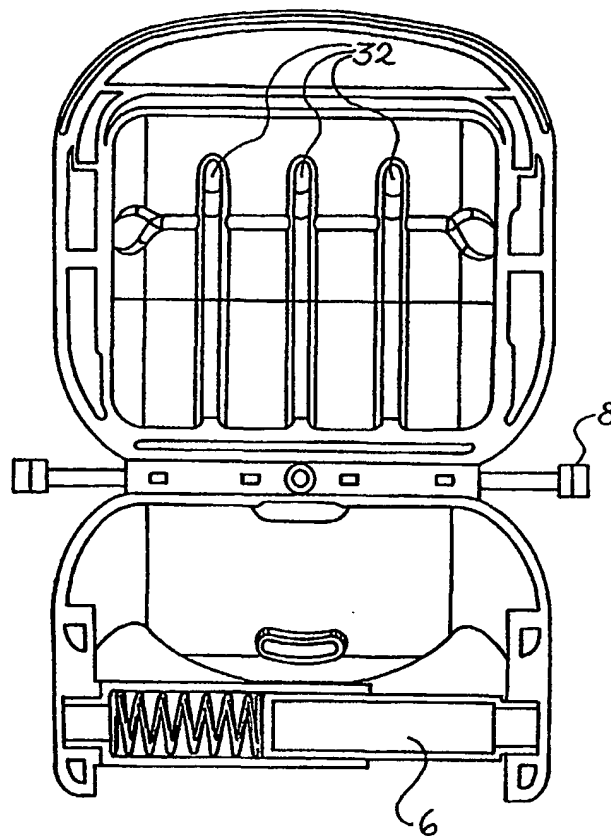


Fig. 13

Fig. 15



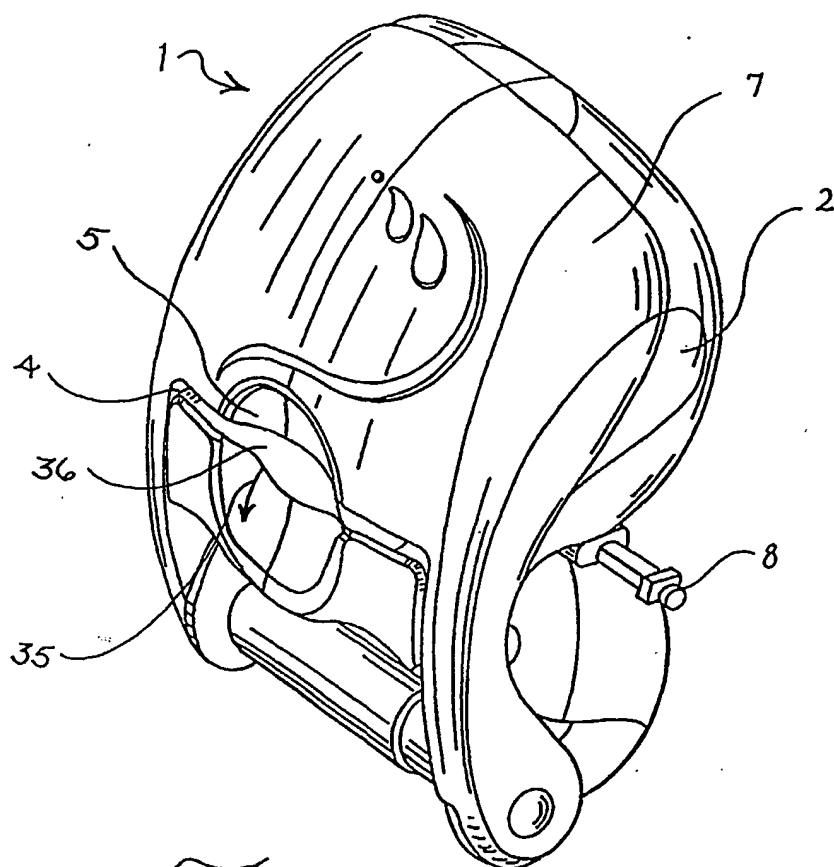


Fig. 16

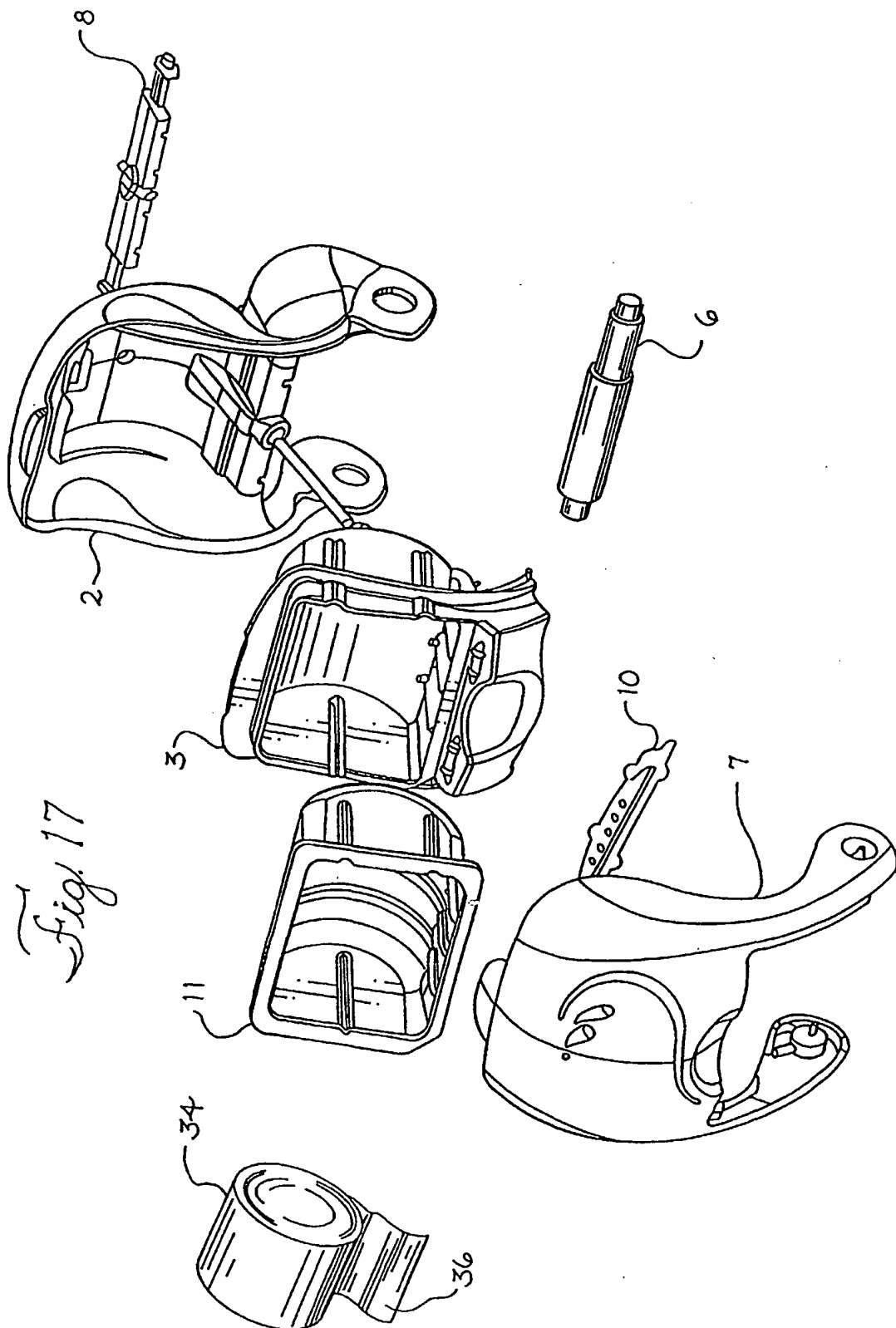
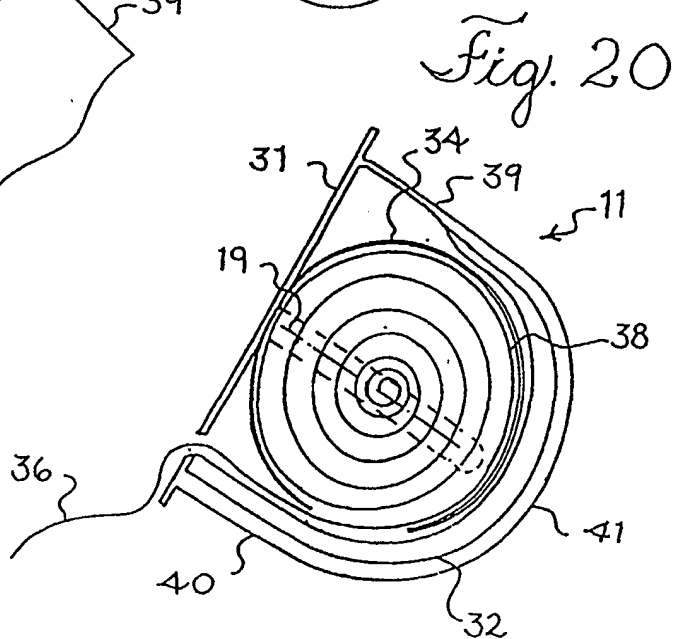
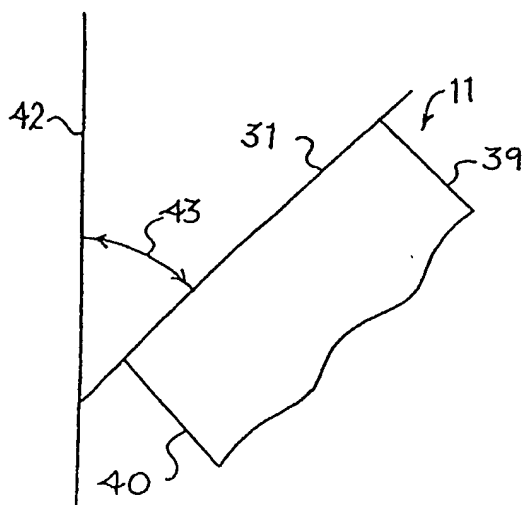
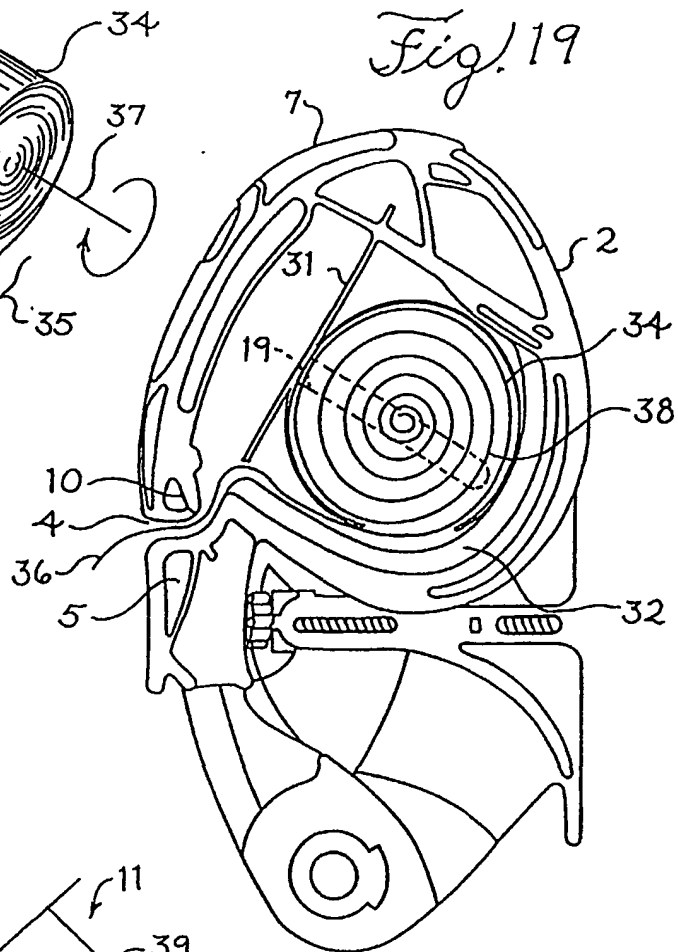
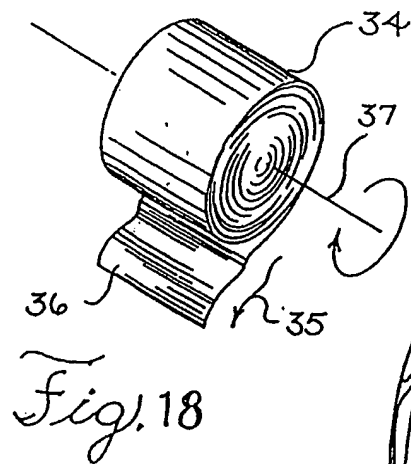


Fig. 17



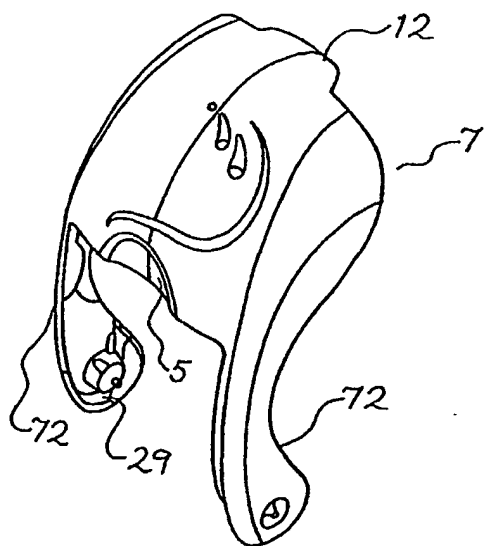


Fig. 22

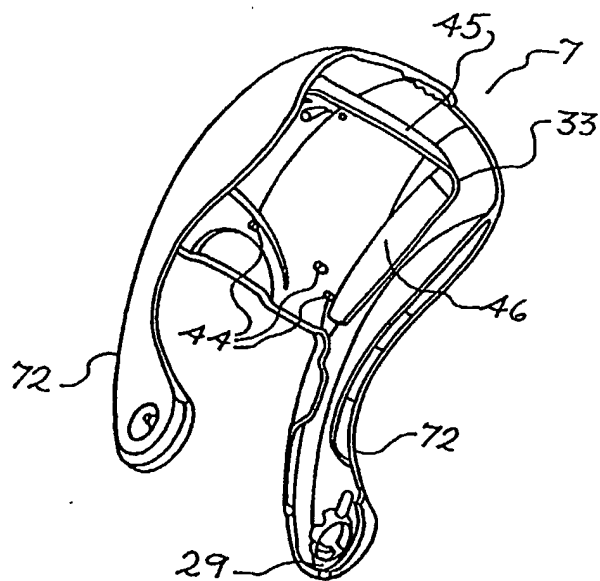


Fig. 24

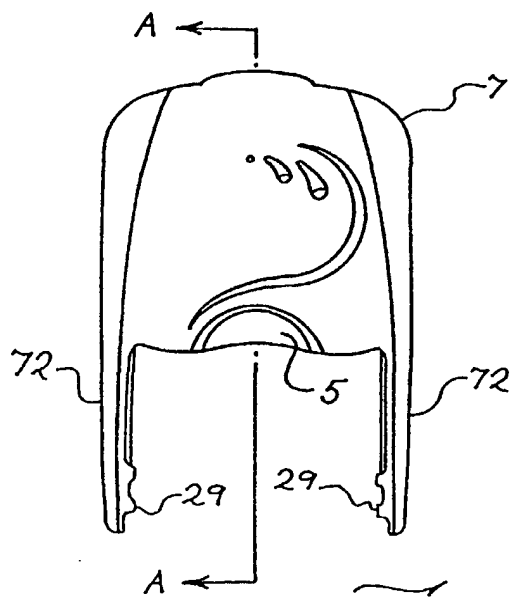


Fig. 23

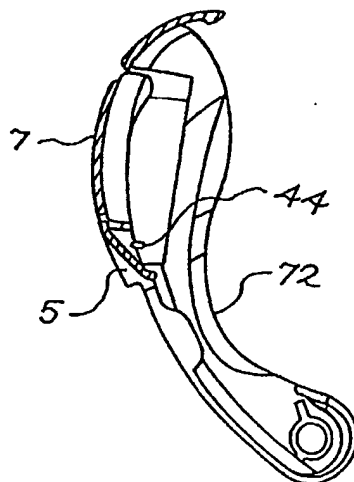
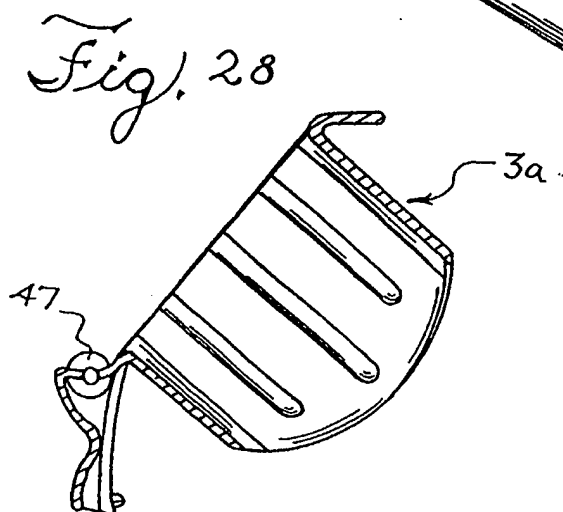
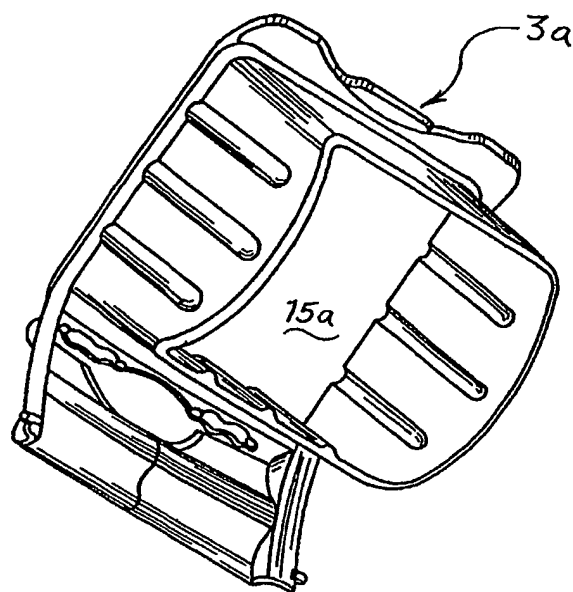
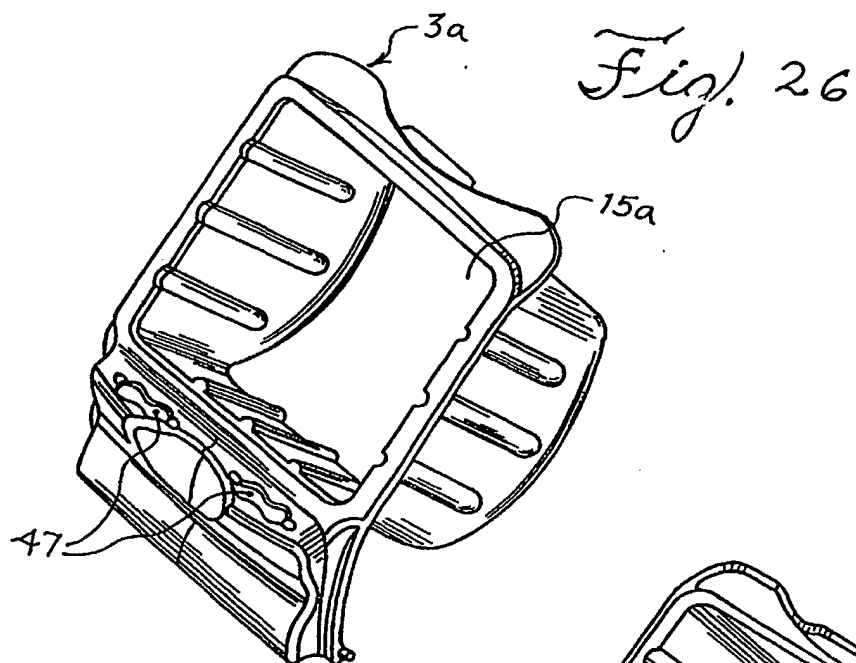
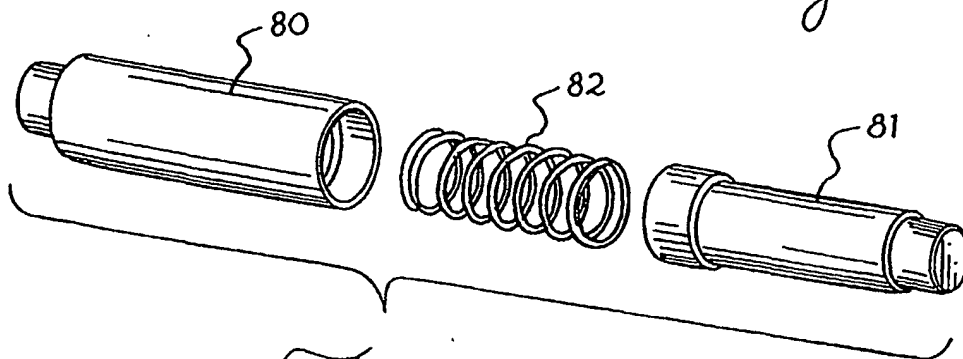
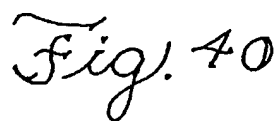
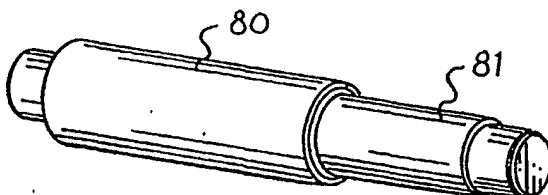
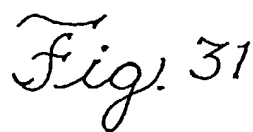
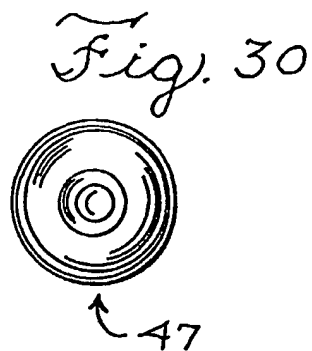
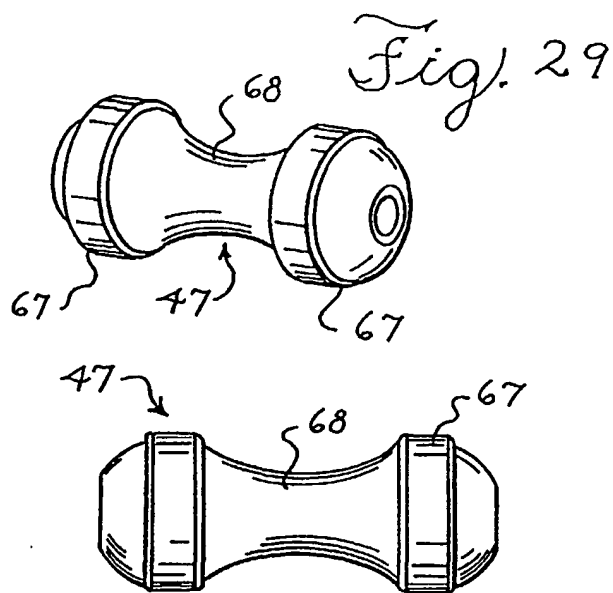
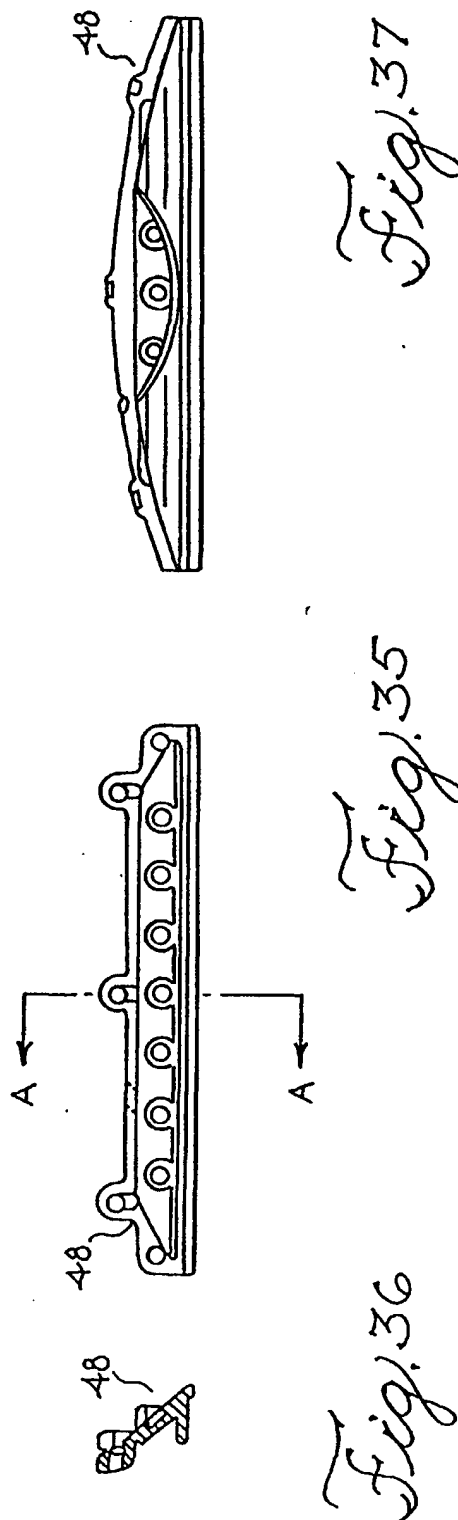
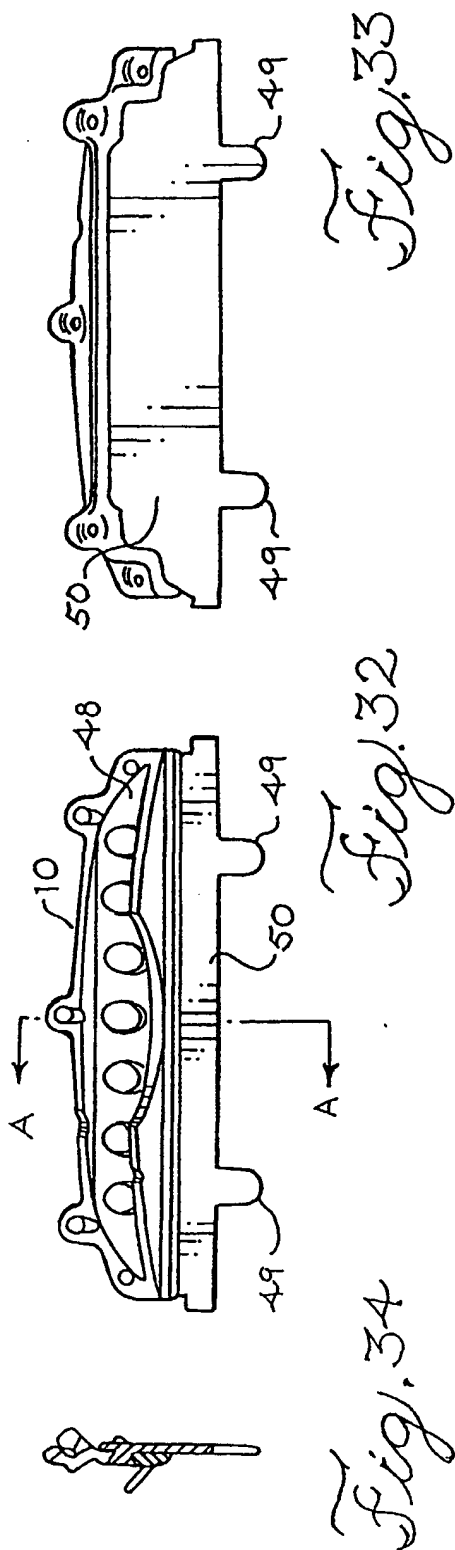


Fig. 25







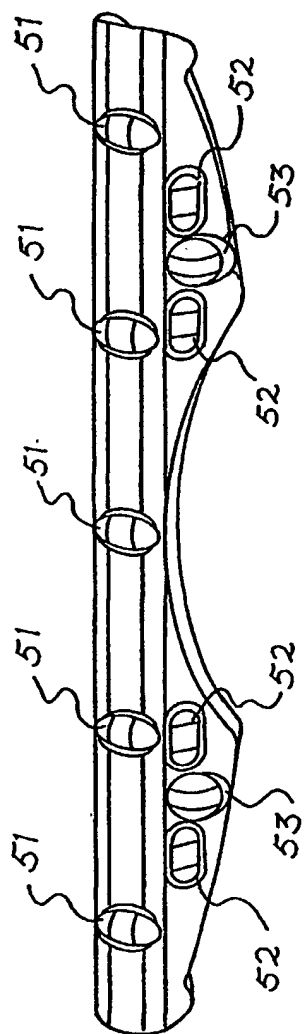


Fig. 38

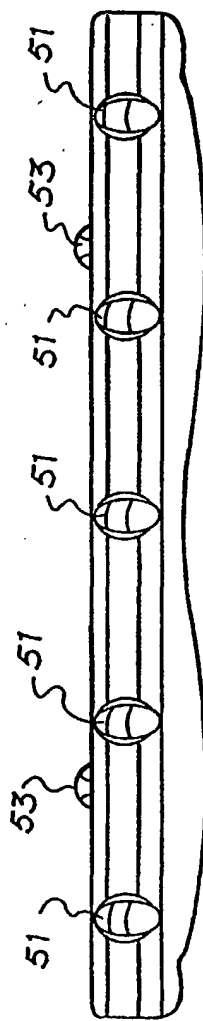


Fig. 39

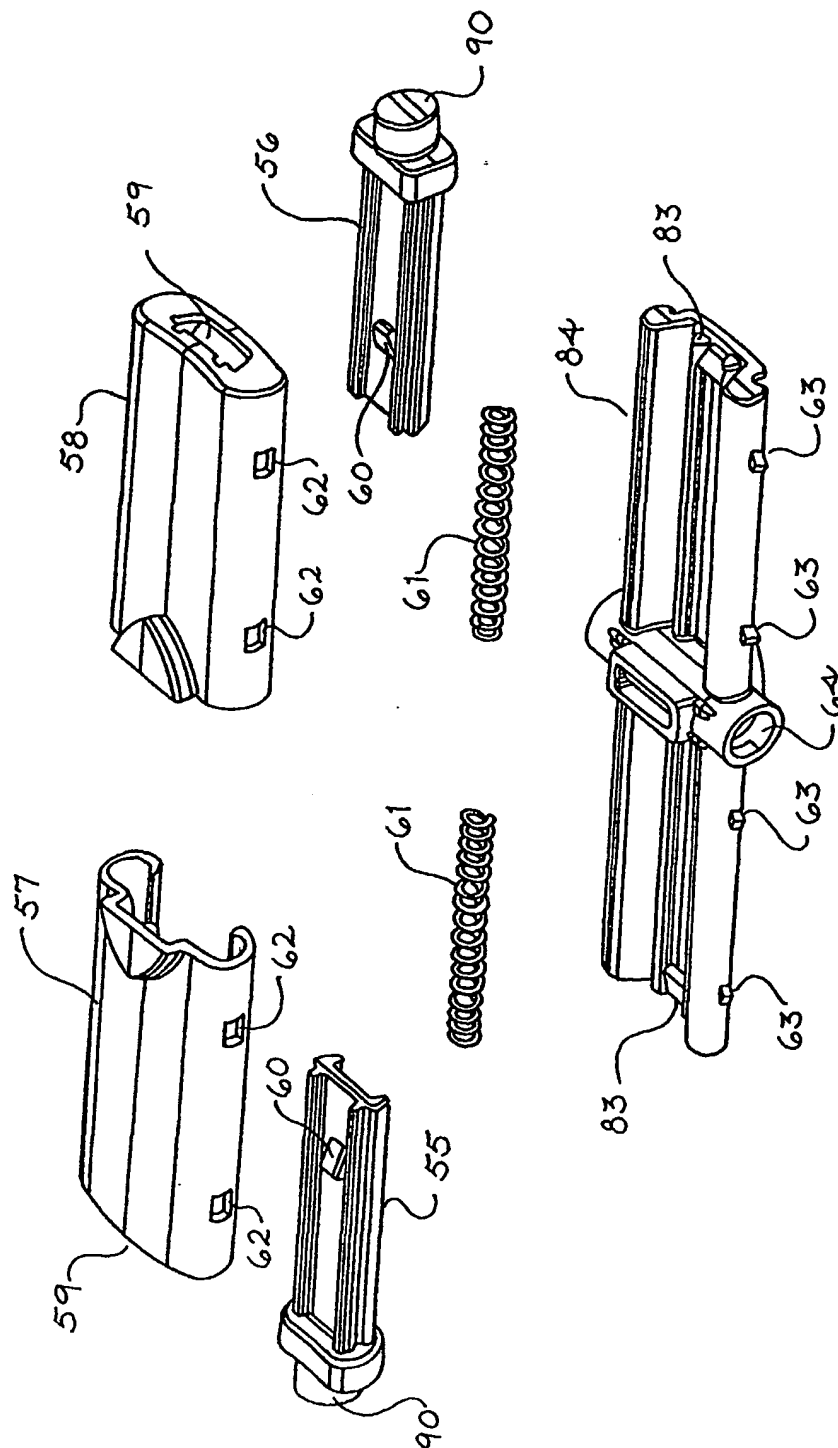


Fig. 43

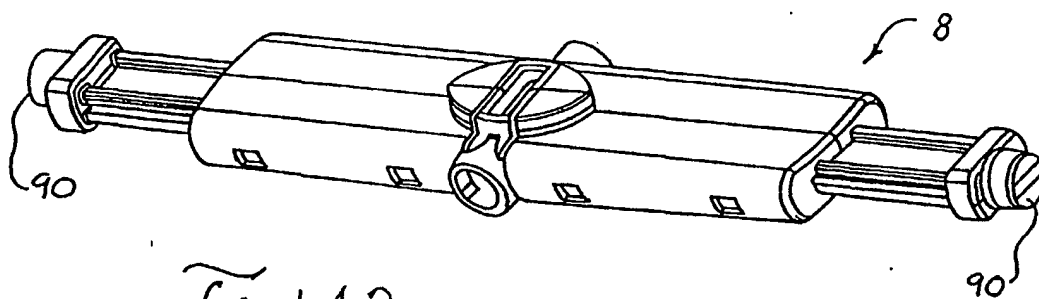


Fig. 42

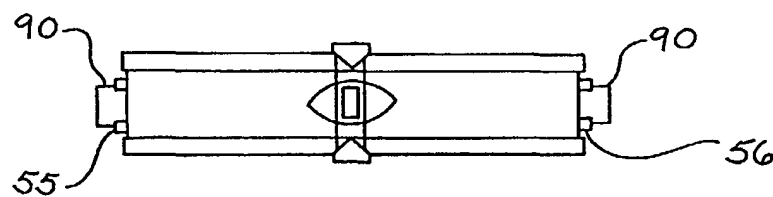


Fig. 44

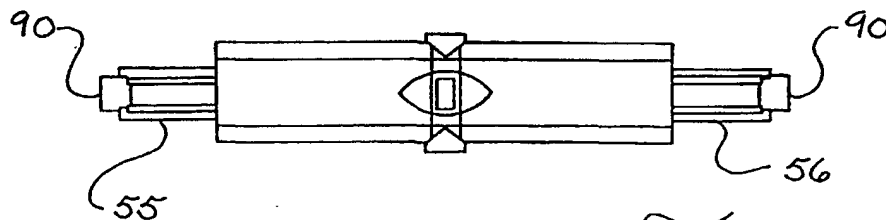
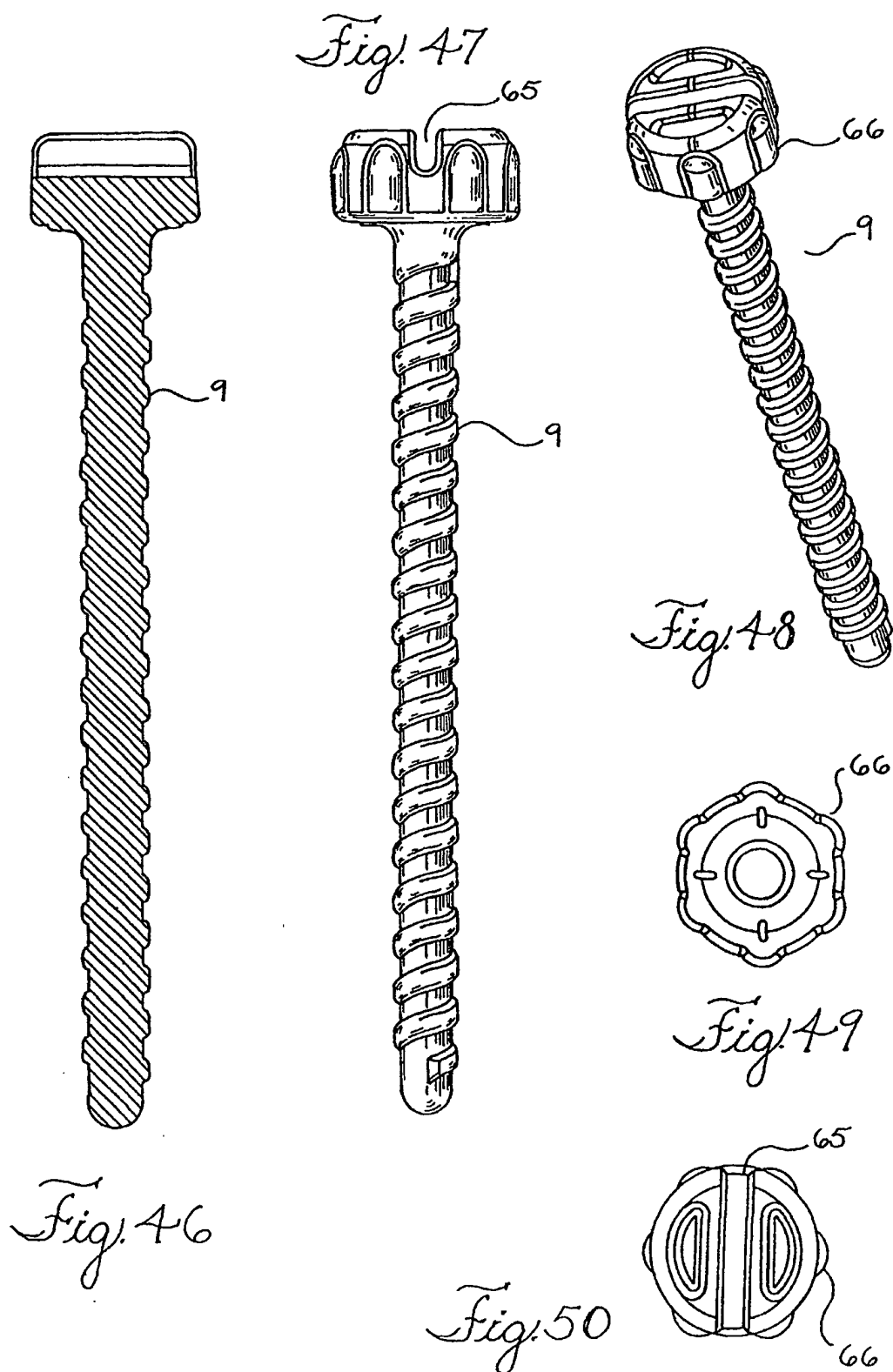


Fig. 45



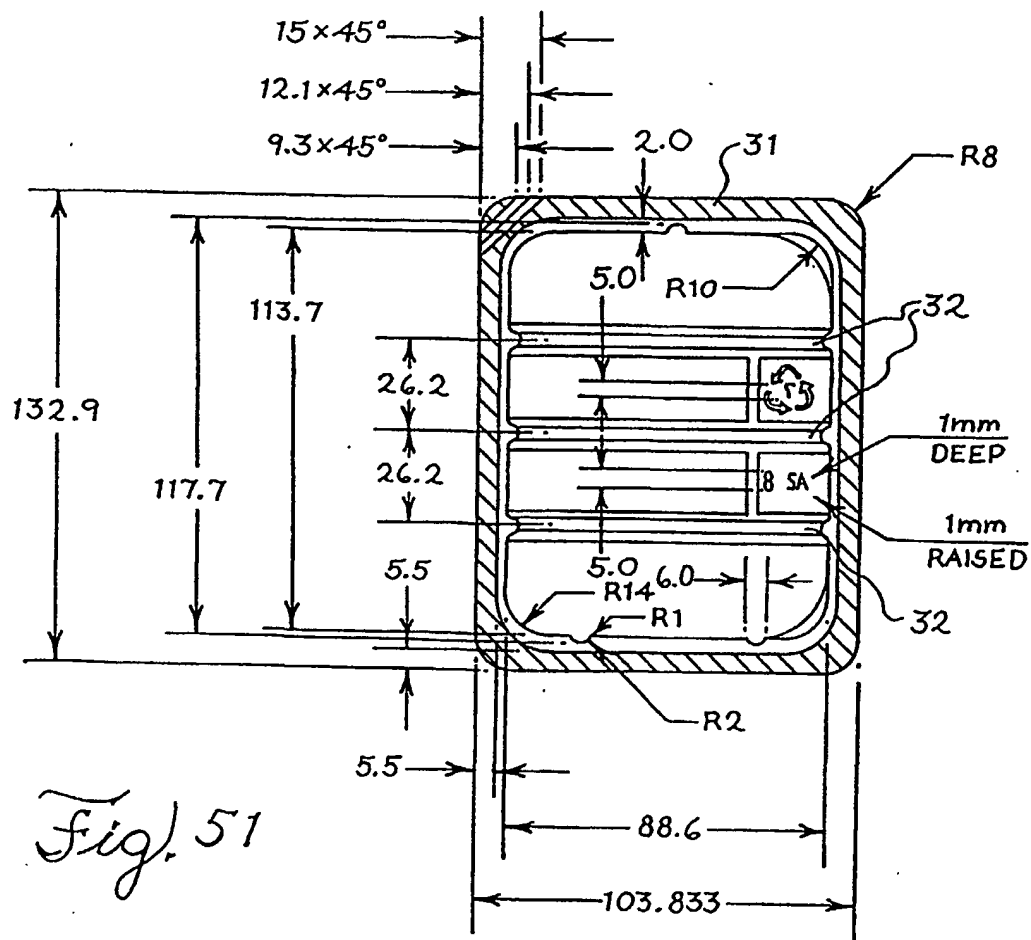


Fig. 51

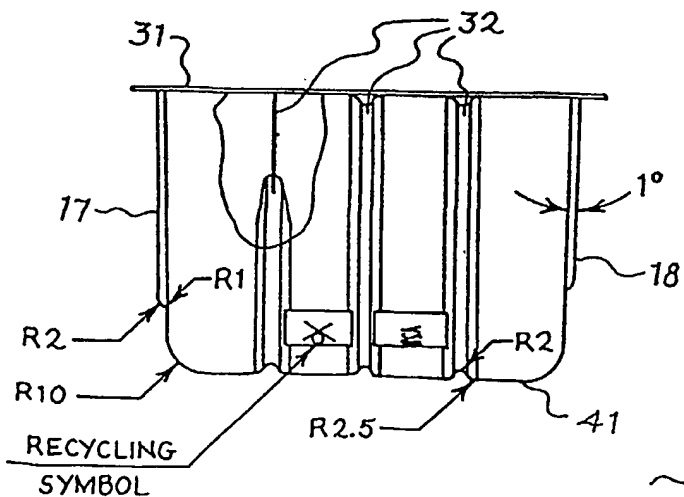
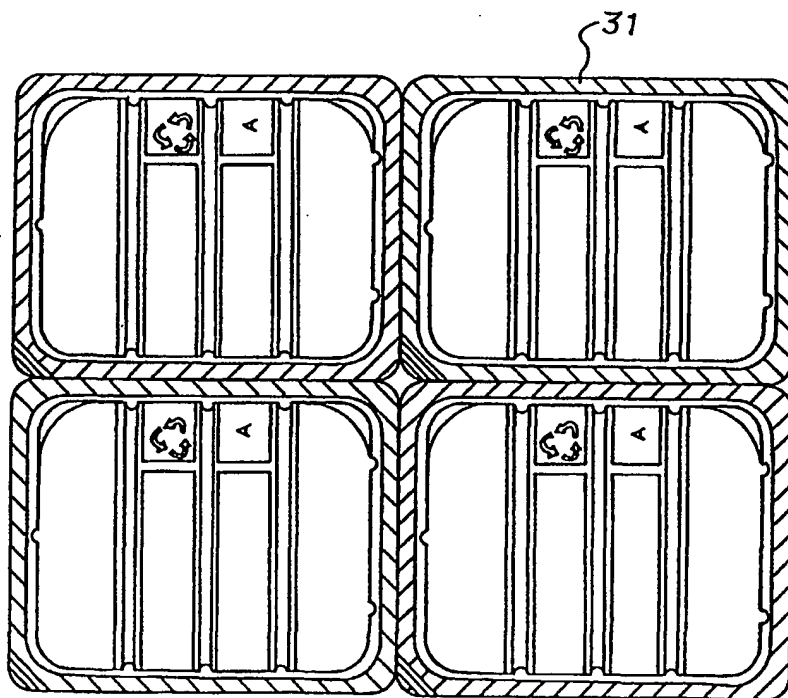
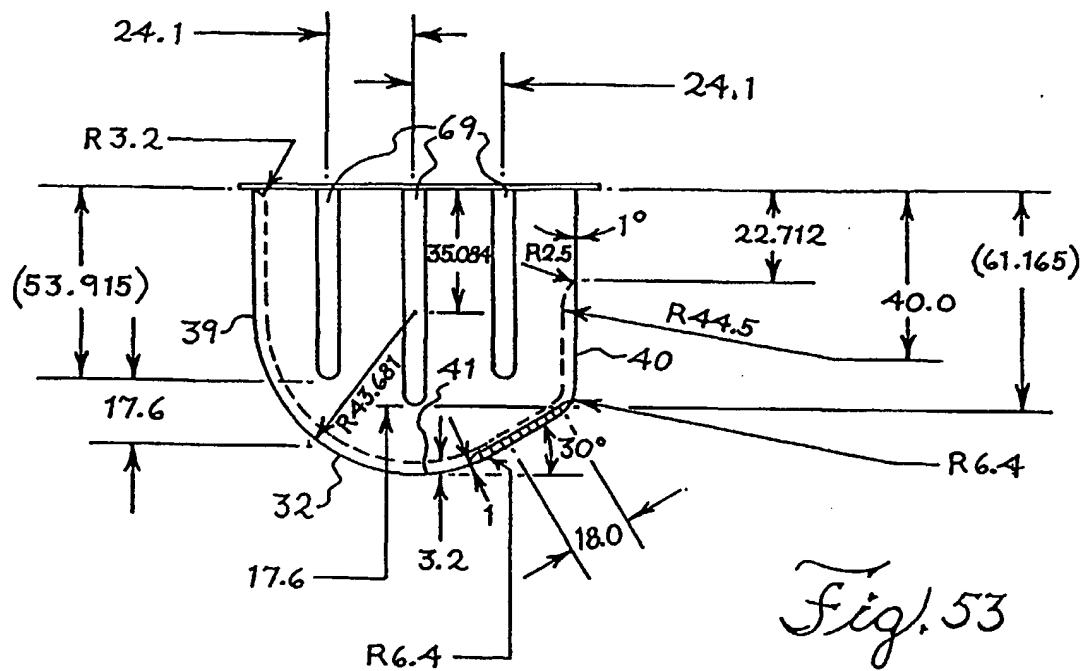


Fig. 52



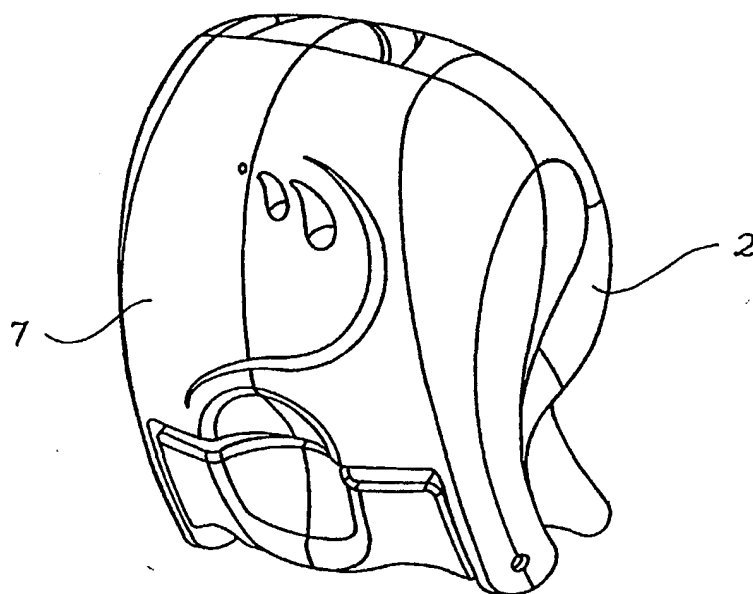
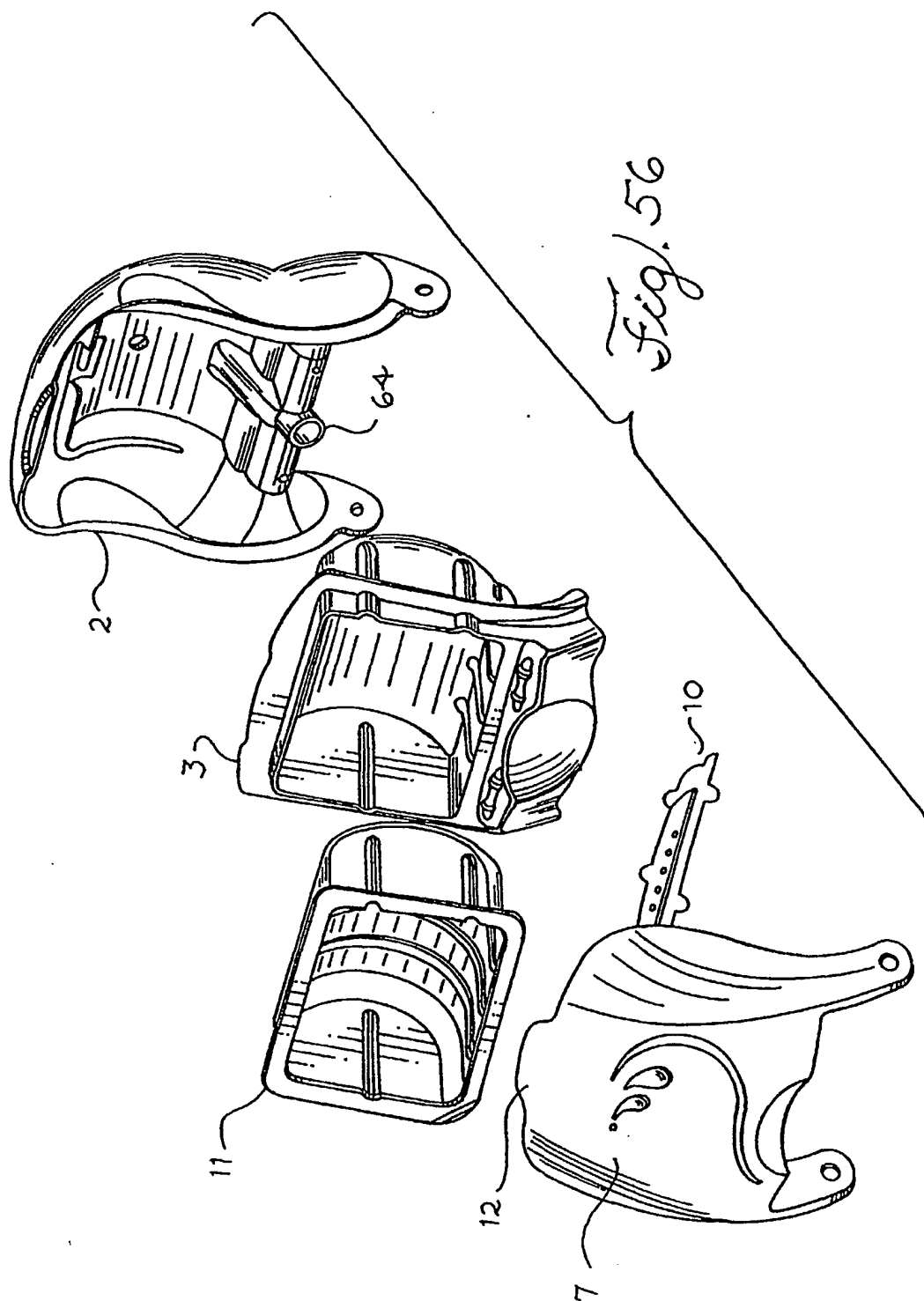
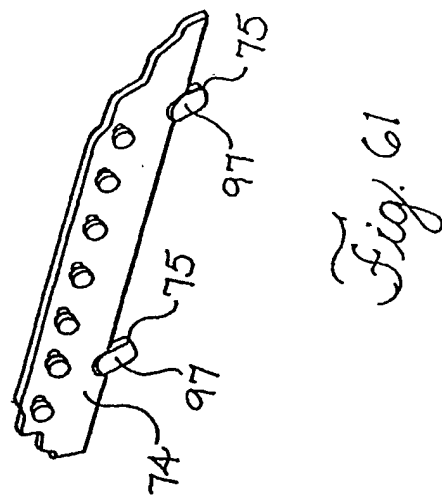
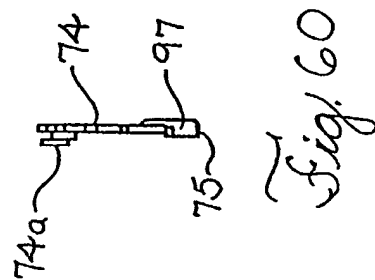
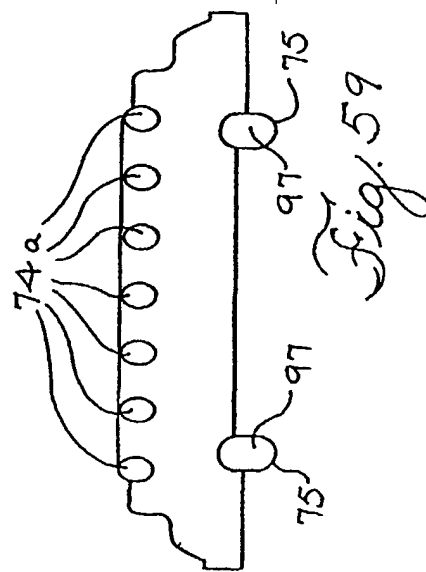
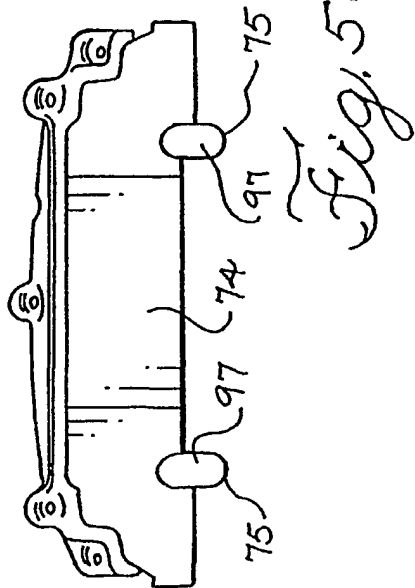
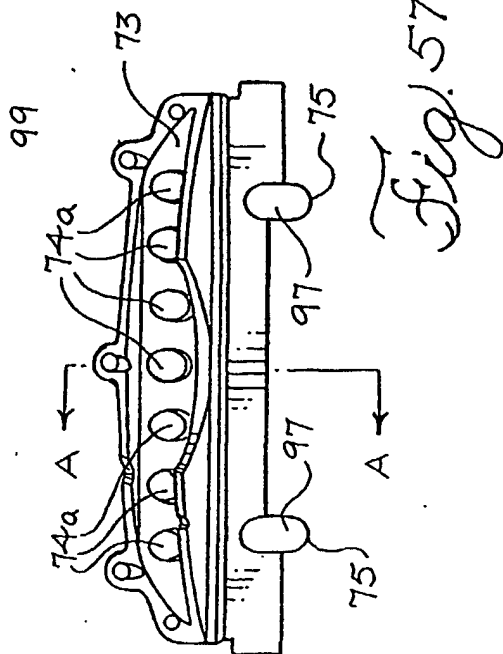
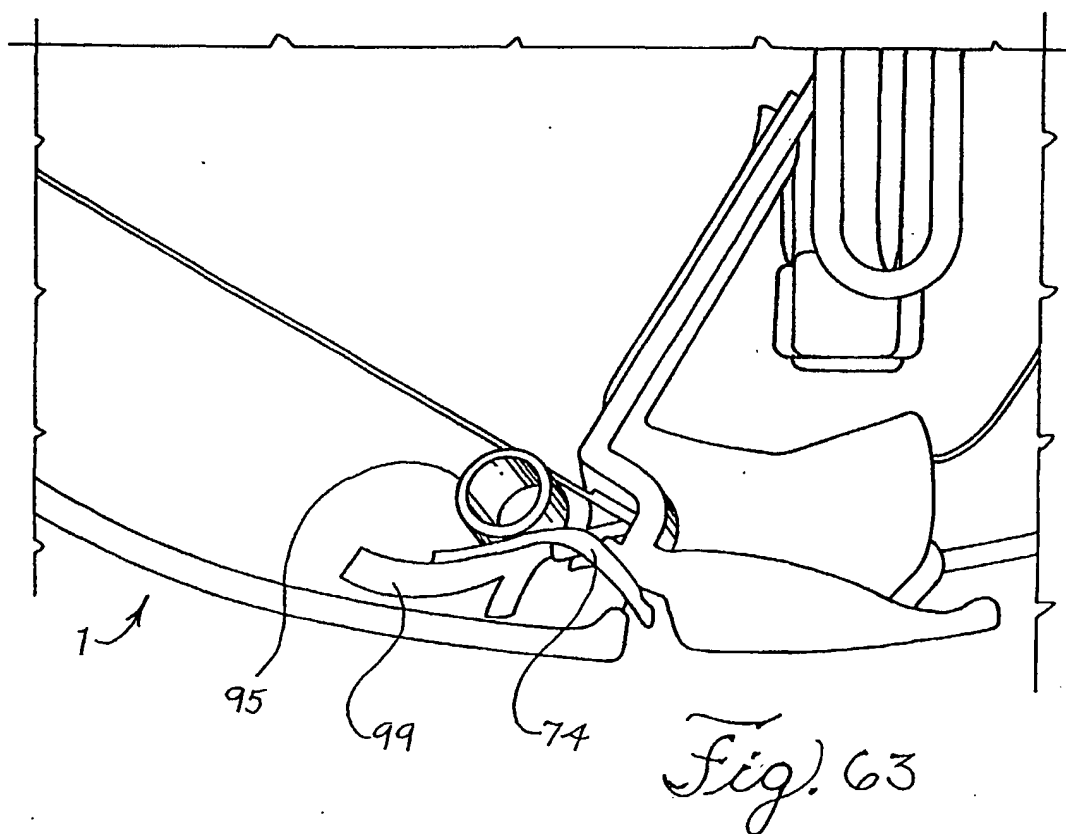
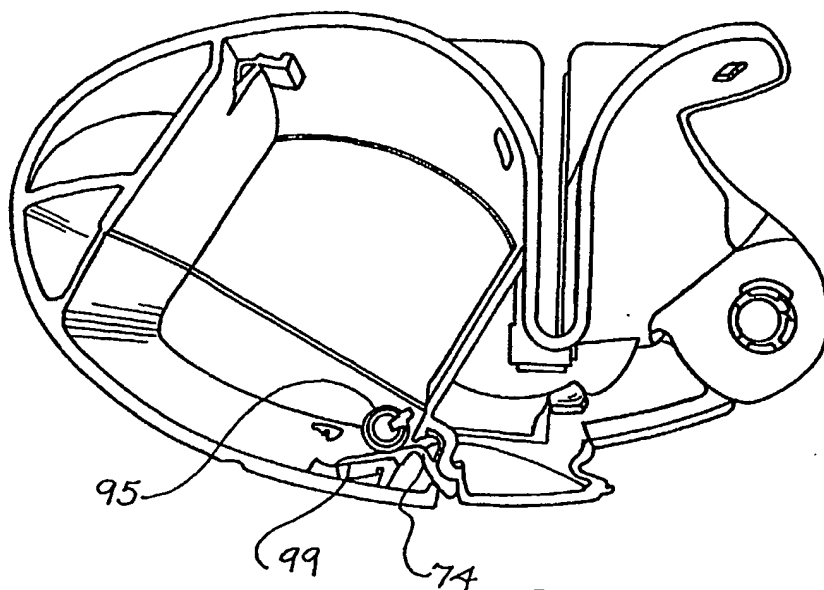
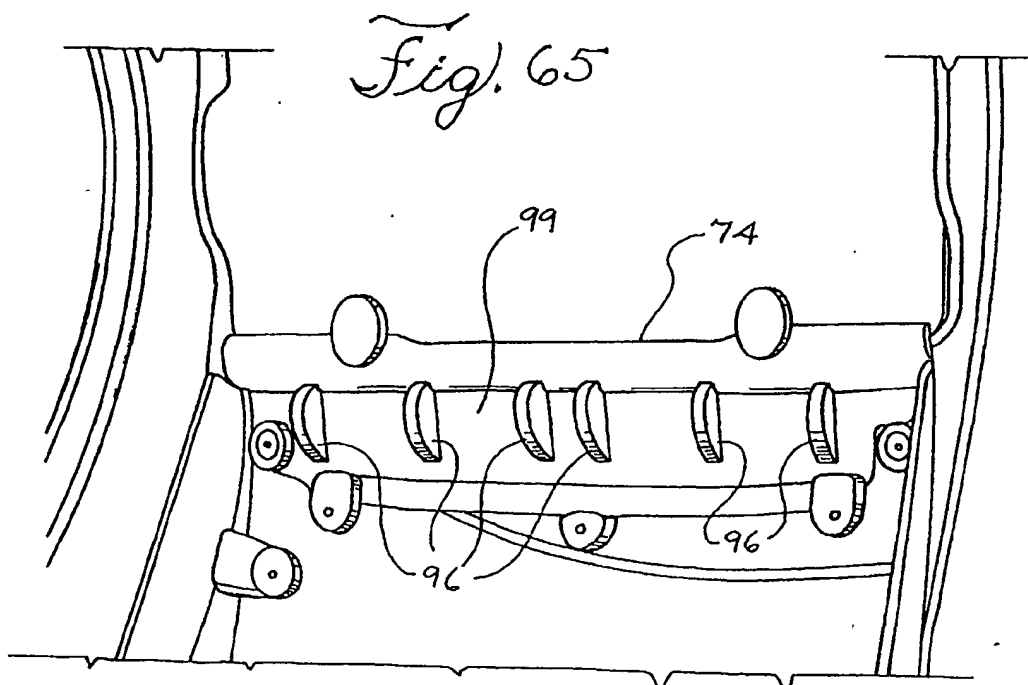
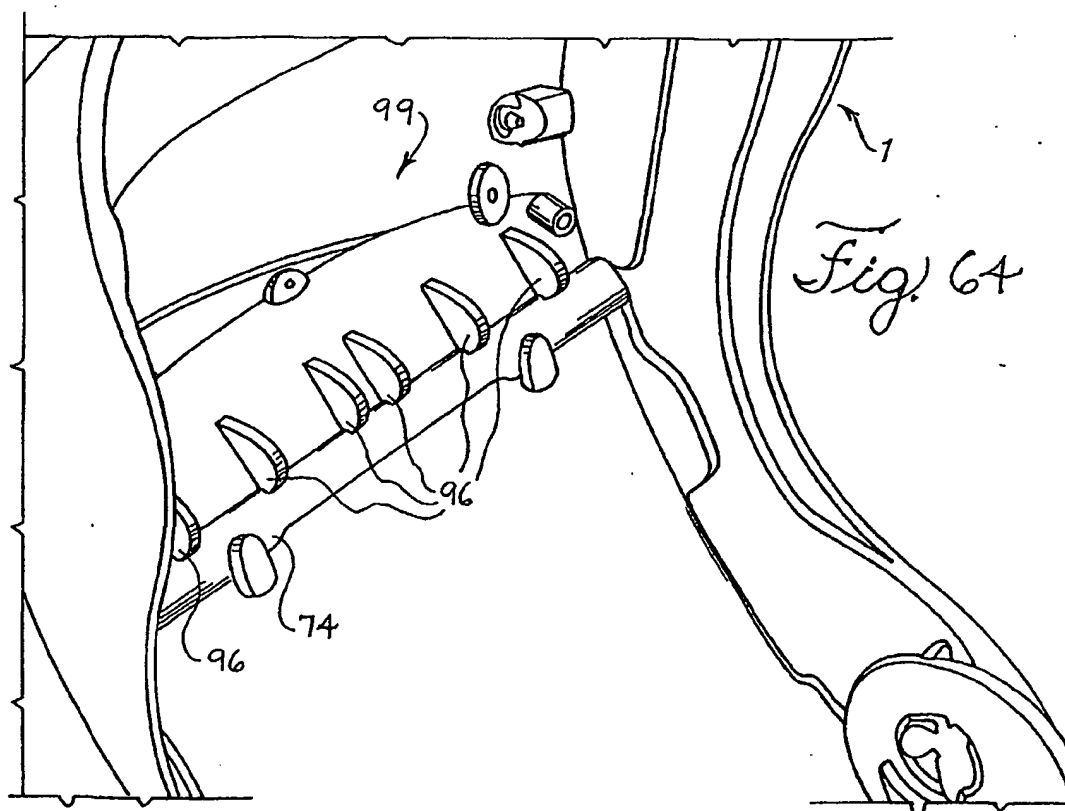


Fig. 55









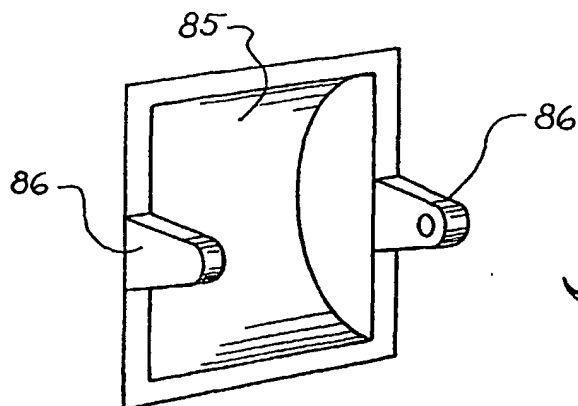


Fig. 66

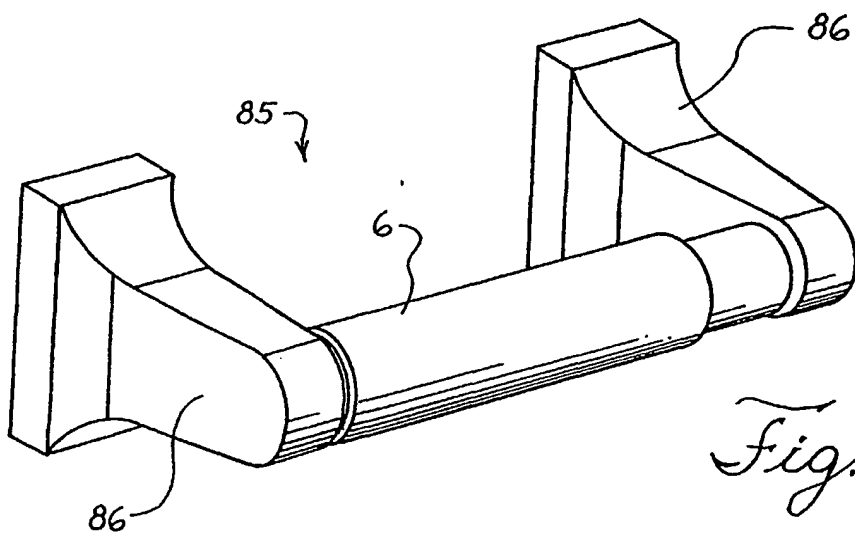


Fig. 67

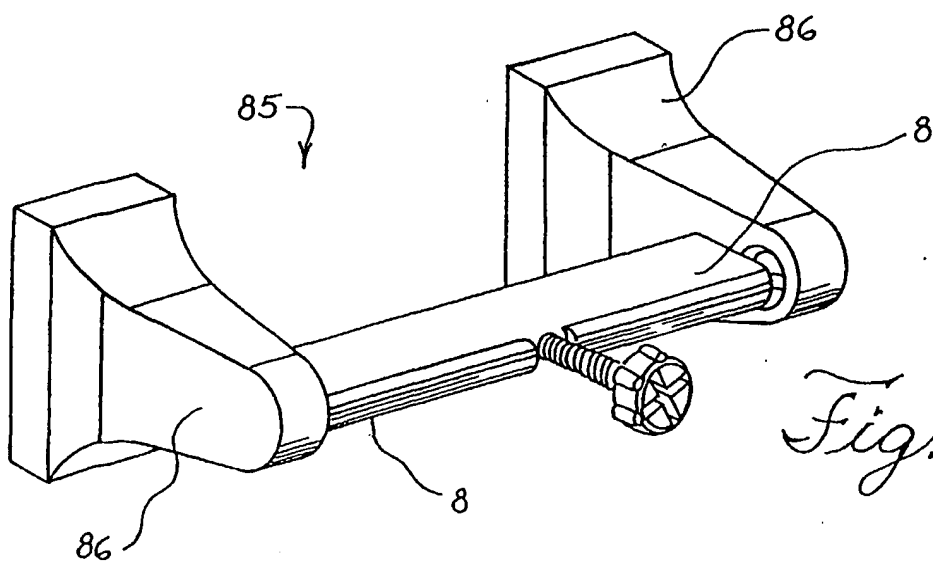
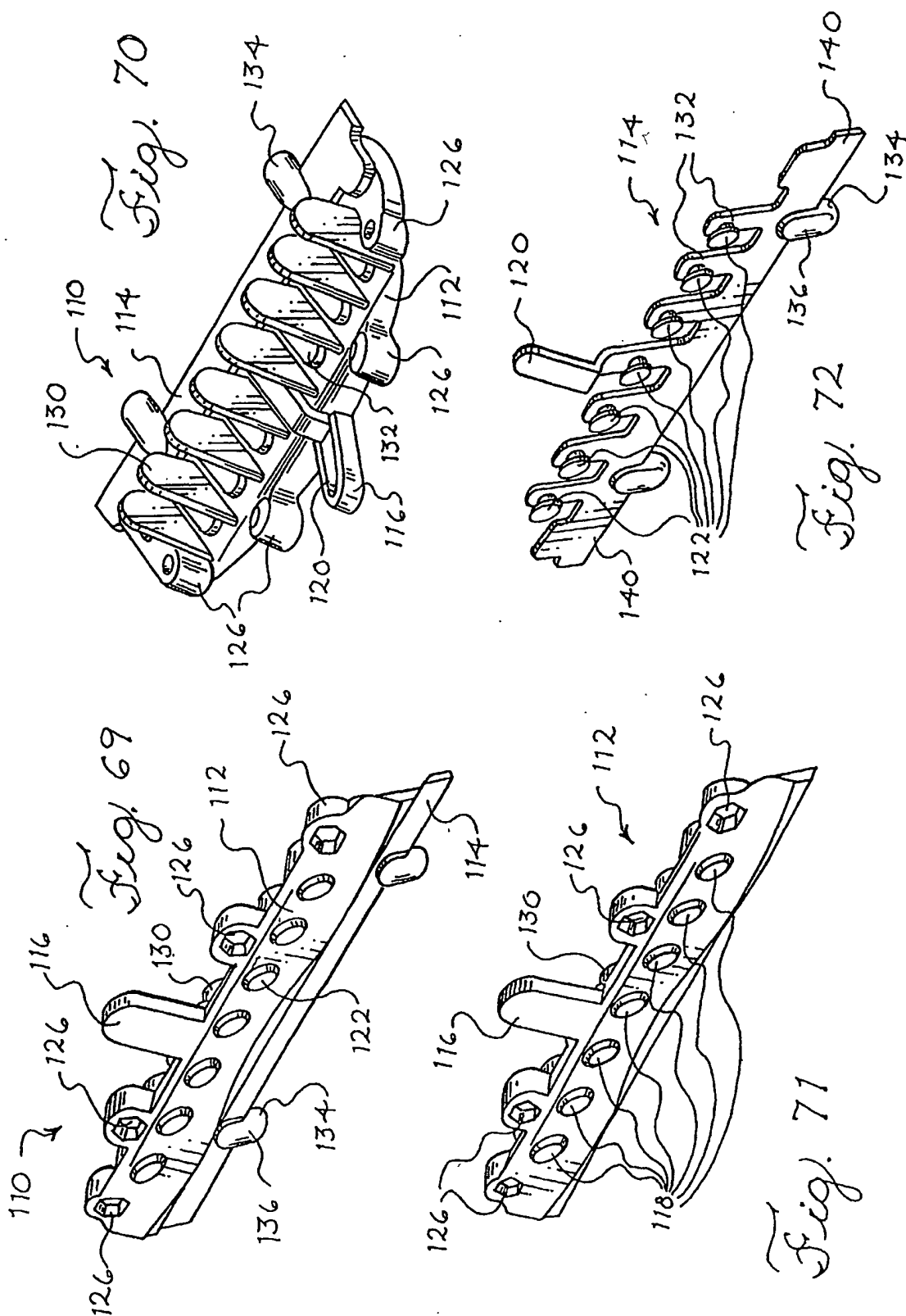
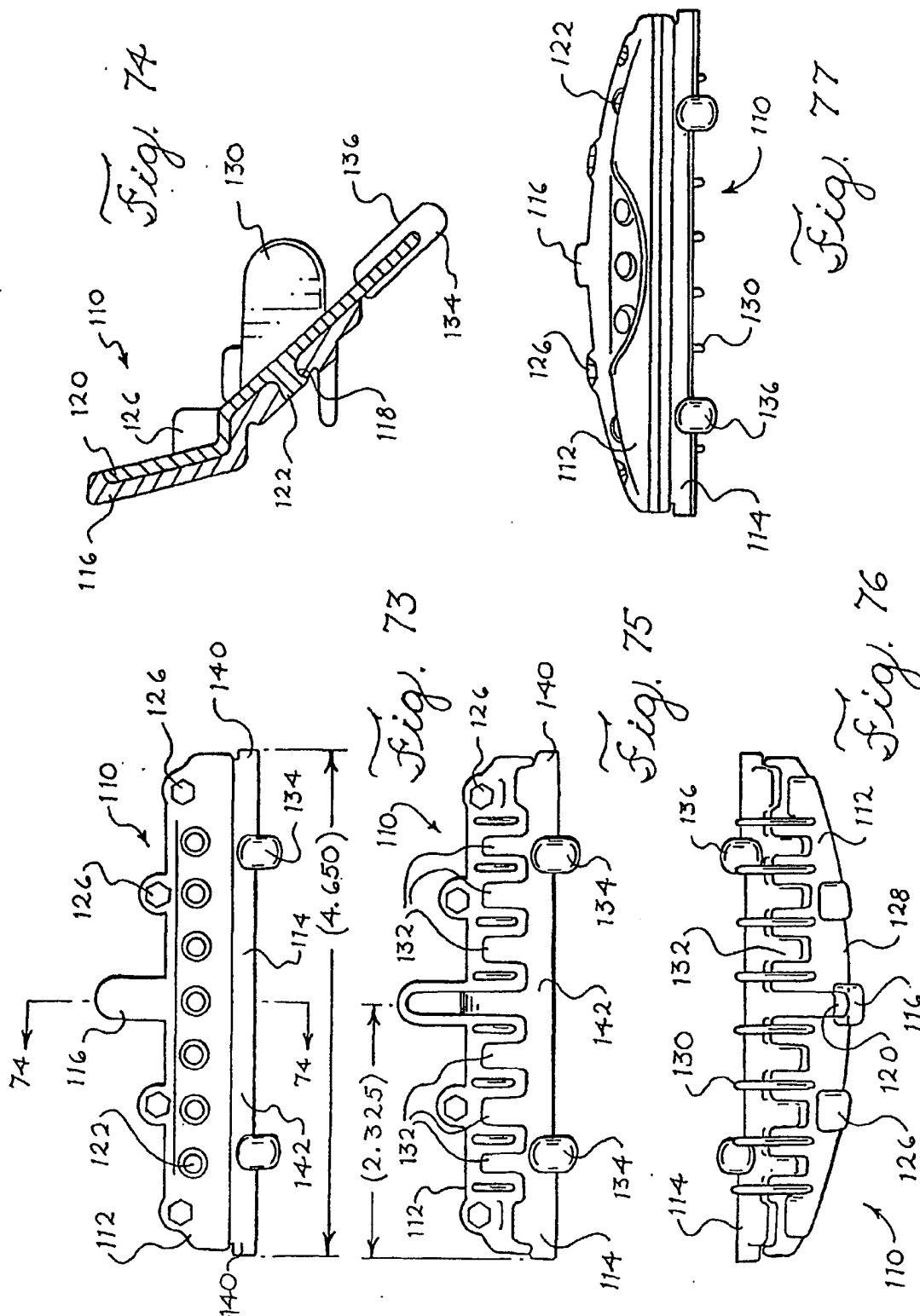
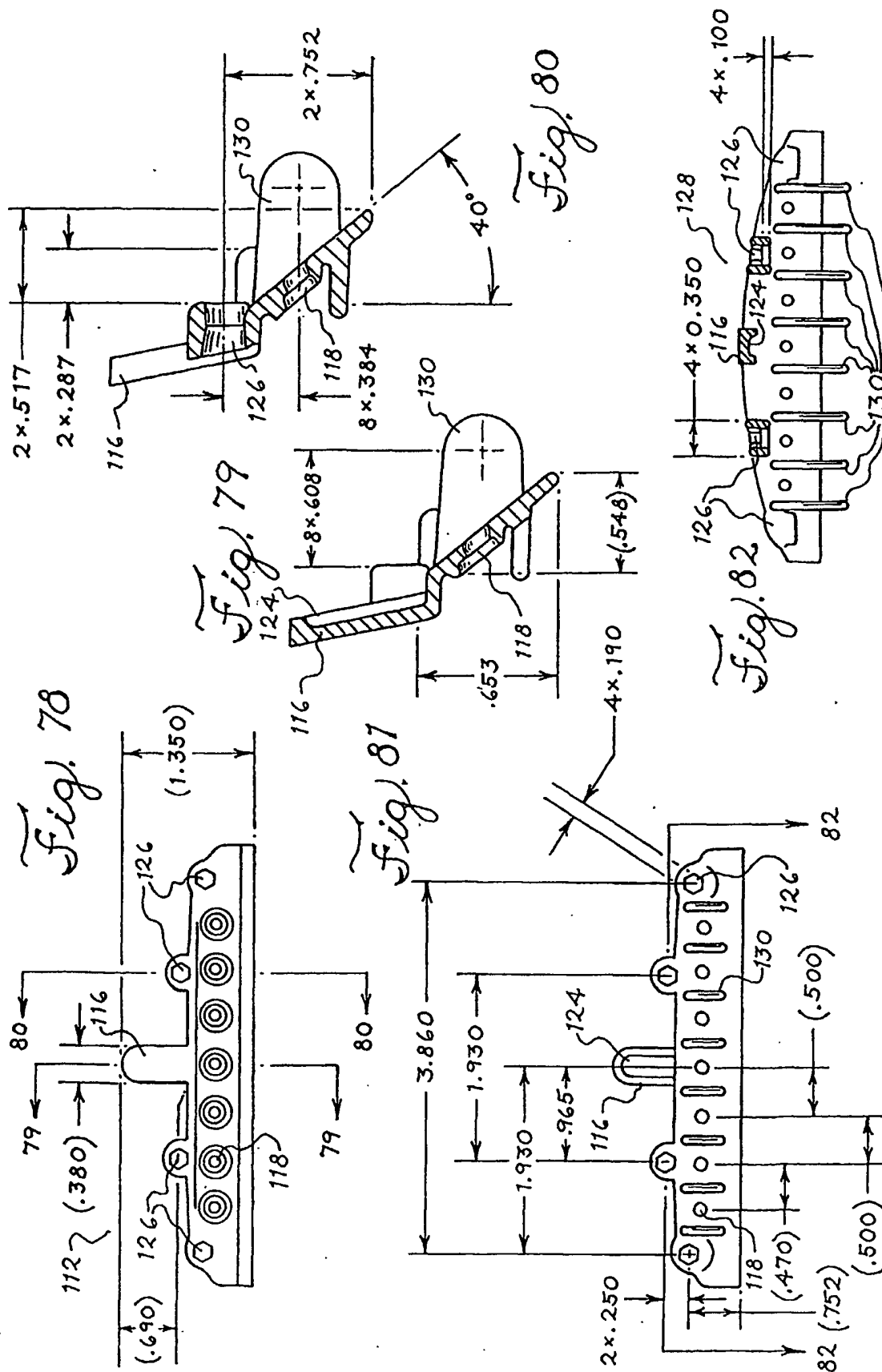
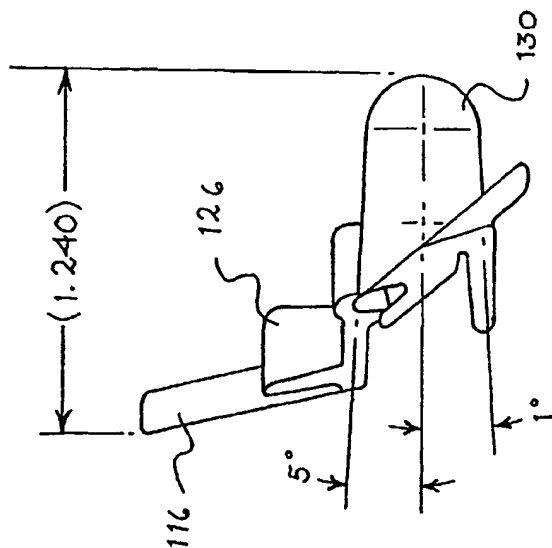
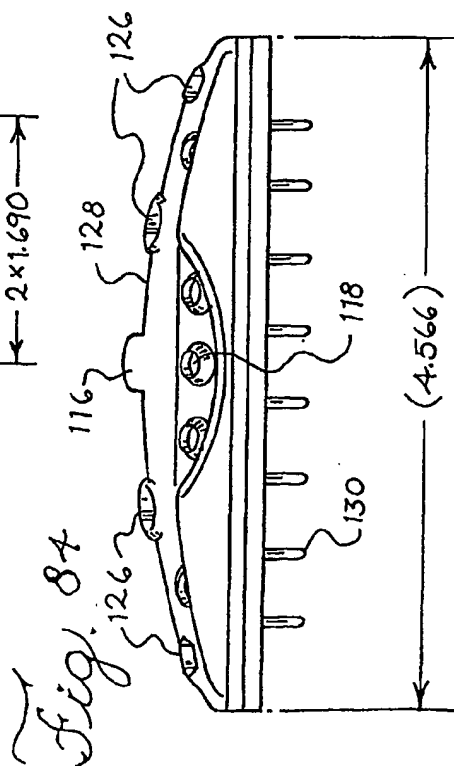
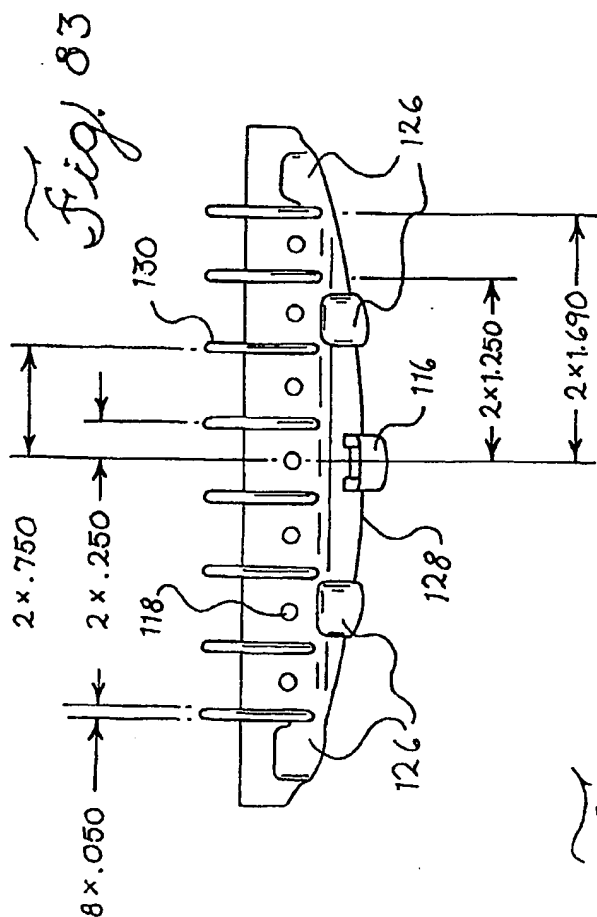


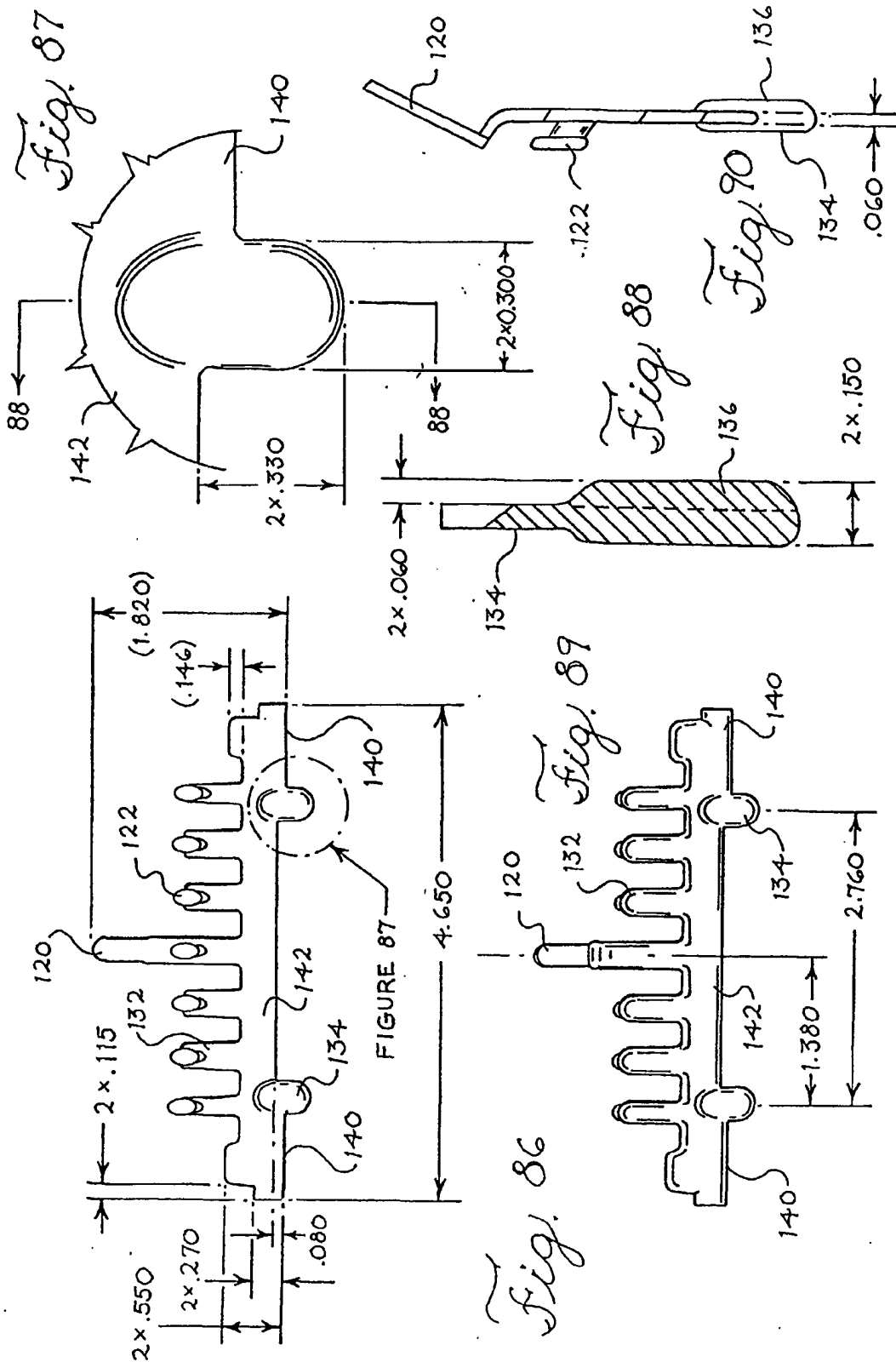
Fig. 68











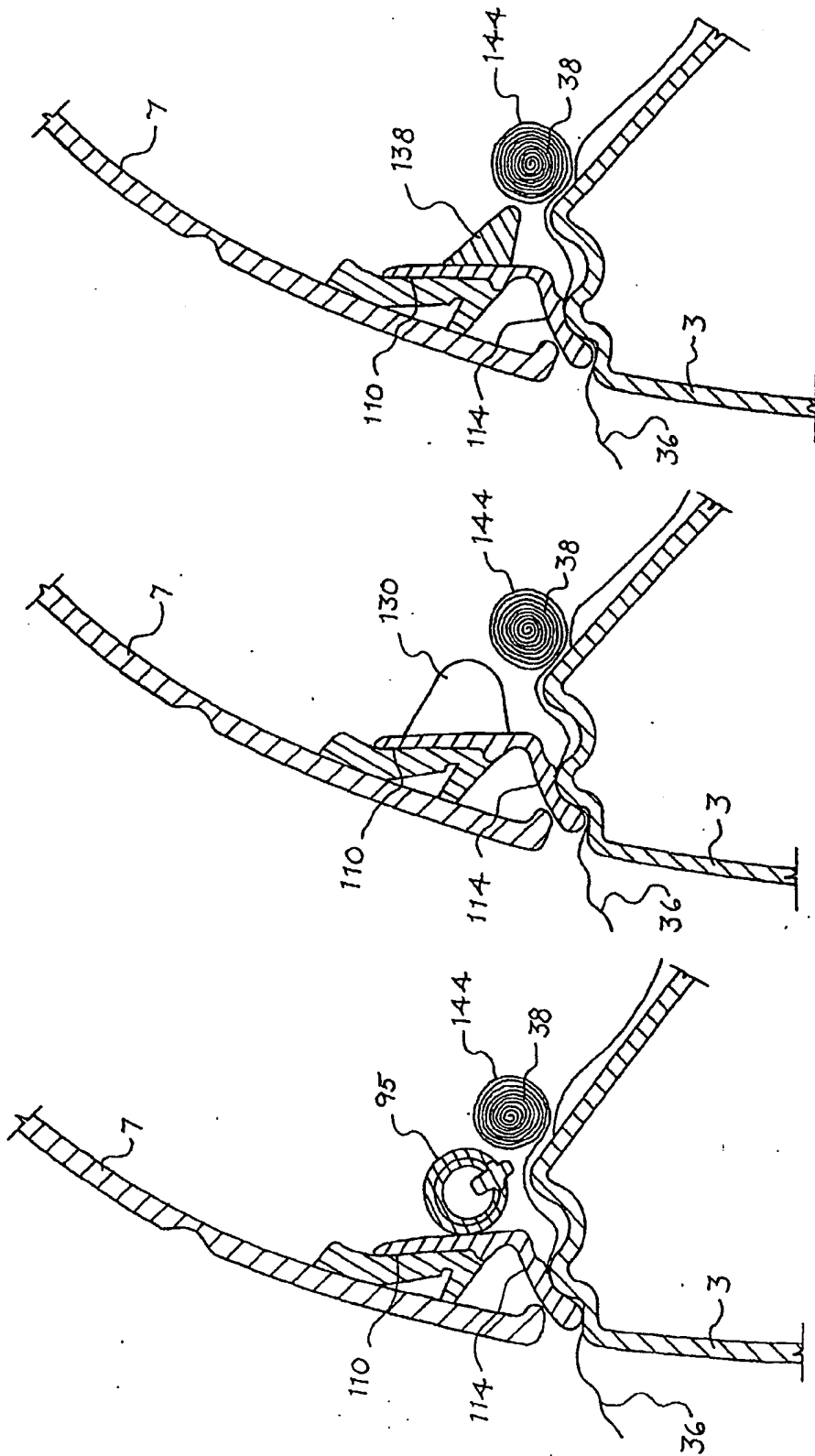


Fig. 91C

Fig. 91B

Fig. 91A